1941

ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXVIII. No. 3293 JANUARY 3, 1941 SIXPENCE

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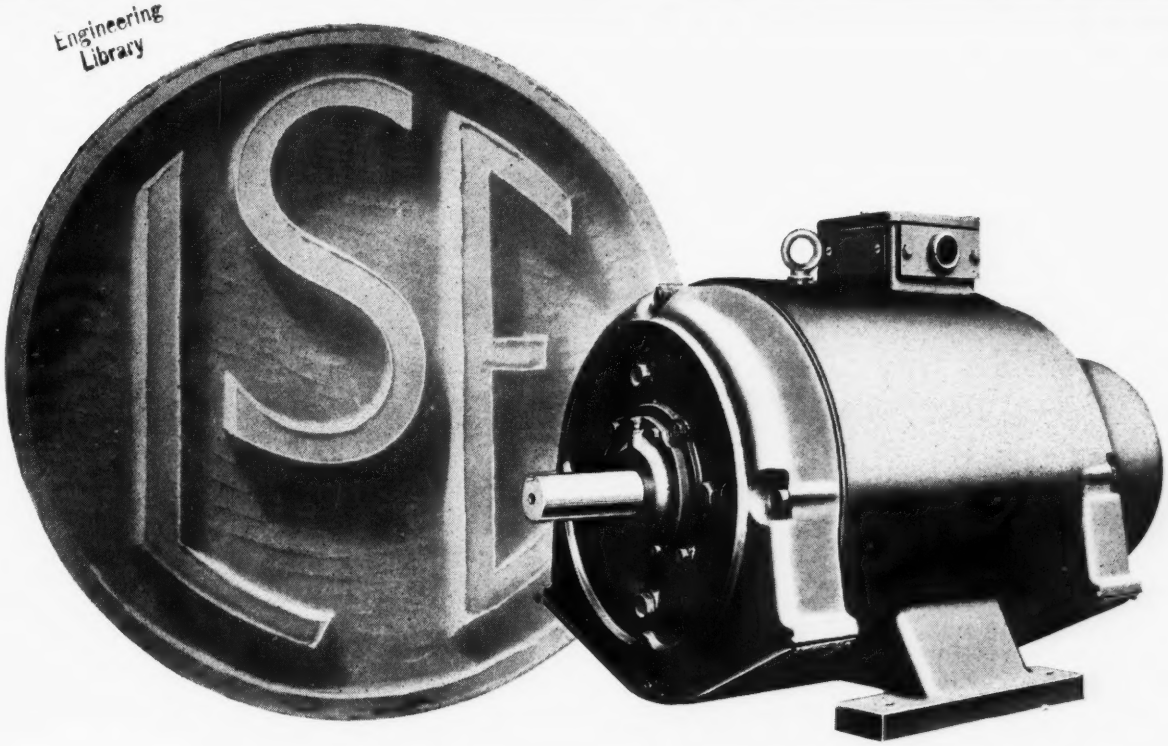

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THE ELECTRICAL REVIEW

Volume CXXVIII **No. 3293**

Friday, January 3rd, 1941

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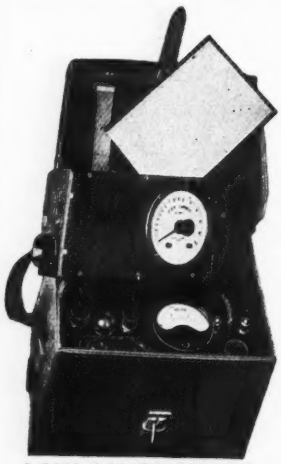

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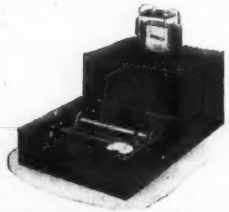

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THE ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER —— ESTABLISHED 1872

Vol. CXXVIII. No. 3293 JANUARY 3, 1941 Price SIXPENCE

The Industry in 1940

Conditions in the Various Sections

HOW did the electrical industry fare during the first full year of war? To answer the question it is necessary to view the industry as consisting in reality of three or four separate sections which are almost industries in themselves, though interdependent.

First we may study the electricity supply industry upon which all the others depend. It has probably had a more strenuous time than any of the others due to the effects of enemy action in many parts of the country; but it has carried on in a remarkable way and, as we have pointed out on many recent occasions, prolonged failure of supply has been practically unknown.

Reasonable Price Increases

Other things have combined to render the position of supply undertakings more difficult—the scarcity of essential materials and the continued rise in the price of coal for instance. To keep the balance of accounts on the right side price increases have been found inevitable by the majority of authorities, but upon the whole these increases have not been proportionately greater than the general rise in commodity prices.

The consumption of electricity has been reduced on the domestic side by the suspension or reduction of hire and hire-purchase schemes and in some areas by extensive evacuation. In the absence of the usual published statistics it is not possible to say whether increased industrial demands have redressed the balance, but it is a reasonable assumption that the total output has, at least, not fallen.

Shortage of materials has naturally affected the electrical manufacturing industry to a far greater extent and yet it is clear from the reports of the leading companies that there has been no shortage of work. Government demands have filled many of the factories and have more than compensated for the falling-off in civil requirements. Remembering a lesson of 1914-18 we have guarded against the absorption of too many skilled men by the fighting forces to the detriment of the supplies to those forces. Consequently the need for skilled men, although felt, has not been so acute as it was at one time during the last war.

The curtailment of the domestic market brought about by restrictive factors—both unavoidable and deliberately introduced—has adversely affected those manufacturers catering especially for this class, but most of them have managed to find work of more immediate importance. These will find reversion to normal production harder than those producers who have switched over from civil to war needs in their own accustomed field.

Abnormal wear and tear of plant due to almost continuous working is one problem which faces manufacturers. An increased rate of depreciation has to be allowed for and this matter should receive sympathetic consideration from Government Departments when manufacturers' costing of contracts is being examined and from the income tax authorities when the question of allowances is raised.

The Export Position

In export trade indications are that the industry has done as well as most, or better than, at least on the "goods and apparatus" side. The figures so far available show that in value the exports for 1940 exceeded those of the previous year. Electrical machinery shipments were retarded by the ban placed on the heavier plant owing to a fear of a shortage for home requirements. This has been relaxed to a great extent but the position is not clear as electrical machinery is not now shown separately in the Board of Trade returns but is combined with all other classes under the all-embracing term "machinery."

One section of the industry has not been fully compensated by war contracts for the loss of peacetime work. This is the electrical contracting section, many members of which have been very badly hit. In a recent statement the Director of the Electrical Contractors' Association said that only about 10 per cent. of the membership had received orders from Government Departments. The position is due in some

measure to the size of the average contracting firm. Government departments will deal generally only with units capable of carrying out large-scale work. A remedy proposed is that the smaller concerns, which have lost most of their ordinary installation jobs, should combine their resources and thus put themselves in a position to undertake large contracts. But this is not the simple matter which some people may think. Many contractors are retailers as well and their troubles have been added to by limitation of supplies and the Purchase Tax—quite apart from the "natural" hindrances to trade introduced by war. The E.C.A. is doing what it can for its members as are all the other associations of the industry. It is fitting to conclude this brief review with a commendation of the arduous work put in by these bodies who have shown themselves to be most valuable in peace but absolutely essential in wartime.

Mining Examinations

IN our leader last week we referred to the merit of the method of examination devised by the Association of Mining Electrical Engineers for ascertaining a man's fitness for a post in a colliery. The use of the word "method" was deliberate since, we gather from the *Journal* of the Association, some misunderstanding exists as to what this implies. In order to pass the examination, which tests the technical knowledge of a candidate as an essential basis, much more than an ability to reply to text-book questions is required. The set questions are concerned closely with colliery practice and can be answered adequately only as a result of some years of first-hand experience, which is in any case a pre-requisite of taking the examination. They have as their complement an oral examination which is designed to bring to light the candidate's personality and also his practical outlook. As the *Journal* says, quickness of action in emergency, intuition and initiative are necessary qualities which, there is little doubt, can be cultivated by the kind of training that leads up to these examinations.

Institution Meetings

THAT almost all the general arguments justifying expenditure of time and travel in attending scientific meetings in peacetime remain valid in present circumstances is the theme of a leader in *Nature*. Meetings in London would have to take place in the afternoons at this time of the year, however. In dismissing objections that such meetings would interfere with war work, it is pointed out that even those who are most fully engaged need some refreshment of mind and would also profit by maintaining contact with others of kindred interests. Probably because electrical engineers are more fully occupied during daylight than are many others, the attendance at Mr. J. R. Beard's presidential address to the Institution of Electrical Engineers, though large, was not such as to warrant an assumption that later meetings in the afternoon would be well attended. The policy of the Institution of issuing copies of the papers to interested members (contributions to written discussions being afterwards published in the *Journal*) appears to be the most practicable. In any case, as *Nature* emphasises, unless papers are published in some form the future revival of a society may be seriously prejudiced. A suggestion worth serious consideration is that sessions might be prolonged into the summer, when meetings could be held after normal working hours.

Restricted Skill

BECAUSE men and women from non-engineering trades who possess some mechanical aptitude can after a short training do work that is good enough for the immediate purpose, there is a danger that the true value of the skilled mechanic may be misunderstood. A realisation of this possibility among men who had served a long and arduous apprenticeship led to some friction during the last war. In a paper presented recently before the Royal Society of Arts, Dr. K. G. Fenelon, discussing the training of operatives in wartime, records manufacturers' views that after three months' training "skilled engineers of restricted talent" can often turn out on *one* machine as good a job as a fully trained man. Dilution of labour, which consists of splitting up work into its component sections, is especially favourable to repetition processes under supervision which are carried out on the large scale of munitions making but not in normal industries. To the over-specialised man it normally offers only a blind-alley occupation without security of employment if the routine is modified. It is the long experience of the tradesman proper that enables him to adapt himself to varied work and gives him the correct perspective to see the task of the moment against the background of the completed product.

Wisdom from Worthing

WE fear that Chambers of Commerce are usually the first to welcome the robbing of electricity revenues for the benefit of local rates. Our pleasure is all the greater when we learn that at a meeting of the Worthing Chamber of Commerce recently it was suggested that a deficit of £29,000 in the Electricity Department's accounts should be recovered from the general body of ratepayers and not from the electricity consumers alone. It was pointed out that in past years large sums had been taken from the Electricity Department as a means of relieving the rates, and it was therefore bare justice that the process should be reversed when the need arose. The Town Council does not view the matter in this light, for it has decided to raise the charges for electricity as from January 1st.

"Co-ordination"

WHEN a local councillor suggests that the Council's gas and electricity departments should be amalgamated the reason is not far to seek—the gas department is not doing so well as it used to. Such is the case at Richmond (Yorks.) where the matter was discussed by the Council, which decided to hold a special meeting on the question. The member responsible for the resolution said the consumption of gas had fallen a great deal during the past few years. He realised that there must be some competition but it need not be "deliberate," and he therefore proposed that it should be eliminated by some co-ordination of the Gas and Electricity Committees. We do not wish to anticipate the result of the Council's special meeting, but if the resolution receives approval we know which department will suffer.

FARMING IN WARTIME

How Electricity Can Help by Saving Time and Labour

By H. D. Phelps, A.M.I.E.E.

Practical advice on the selection and installation of electrical equipment for a variety of operations on the farm is given by the author, who draws upon his experience on the North-East Coast

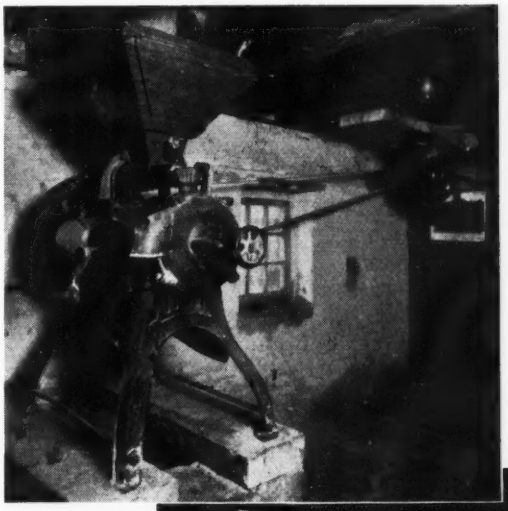
IT is the irony of present conditions that while farmers are working under more profitable circumstances and feel able to improve their premises, there should be special difficulty for the electricity supply industry in extending its agricultural electrification schemes. This difficulty is due to the demand which is being made by more urgent national services on materials used in the construction of electric lines. Because of this it behoves every farmer whose premises are already electrified to consider how best he can extend his uses of electricity to the utmost to assist him in cutting down time and labour. He is then better able to get through the extra work thrown upon him by the ploughing-out scheme and by the lack of imported and prepared feeding stuffs, as well as by the scarcity of labour, and so to increase his output and, possibly, to free labour for use by those less fortunately placed.

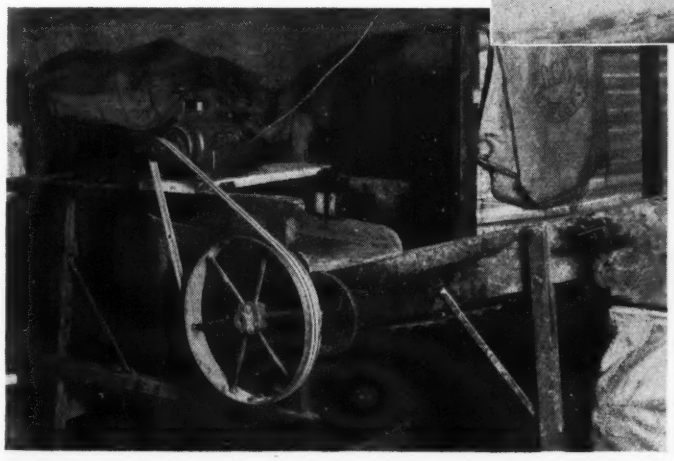
In the first place the farmer must remember that all additional uses of electricity will lower his average price per kWh, either by the extra energy taken at a lower step of his sliding-scale tariff or, if his tariff is based on a standing charge and kWh rate, by spreading the standing charge over a greater number of kWh. When tariffs are not of these types the supply authority may yet offer a more favourable tariff for the increased consumption.

For the general installation on farm premises, wiring in screwed steel tubing, mounted on spacing saddles, with ironclad switches and watertight fittings, is the system I normally favour, but under present conditions, now that steel is not easily obtainable for this kind of work, tough-rubber covered cable (which is readily available) should be adopted, thus providing an all-insulated installation and reserving such steel as can be obtained for the heavy power circuits. For maintenance purposes, it should be remembered that all previously unpainted steel parts should be covered at the end of the day during the erection period with a coating of bituminous paint.

Electric motors are easily procurable with a "permit," which is granted without hesitation by the Ministry of Agriculture and Fisheries if the machines are required for agricultural and similar purposes. Herein lies the opportunity to cut down not only time and labour, but also the use of imported petrol, paraffin and oil. Moreover, an electric motor, if space is limited as it is in most farms, can be suspended from the existing walls or overhead joists. Often, too, more suitable places can be found for some of the machinery when driven by individual motors than when it is all driven from the same shafting as is necessary with an engine. For instance, a turnip-cutting machine can be driven in the turnip house by a ¾-HP motor mounted on the cutter itself, the same motor being used for potato grading.

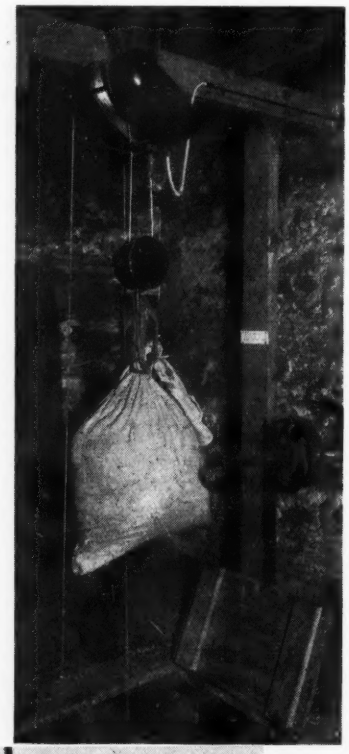
Self-cleaning turnip-cutters require up to 2 HP. The motor can be fixed either to the floor, wall or ceiling or made portable by being mounted on a small bogie, enabling it





Left and below: Saving floor space by fitting motors to the roof. The multi-purpose portable motor beneath is fitted to a wooden bed and is here seen working a potato grader

to be used about the farm, a tough-rubber trailing cable being used with plugs installed at suitable points on the buildings. Sometimes the chaff cutter is found to be fixed in an inconvenient position; an electrically driven machine can be moved and a fan can be added to blow the chaff into one or more chaff holes, depending on the size of the farm. Where large quantities of corn or cake are handled, it certainly pays to install a 3- or 4-cwt. hoist incorporating a small electric motor or to adapt a portable motor bogie to operate a friction hoist.



Grinding and crushing mills usually require from 3½ to 8 HP to drive them, but on large arable-feeding farms, mills requiring 12 or 15 HP are installed. Before the war, wise farmers bought their maize and corn whole and ground it themselves when required, at a much less cost with electric power than the some 10s. or so per ton extra charged by millers for delivery if already ground, crushed or kibbled.

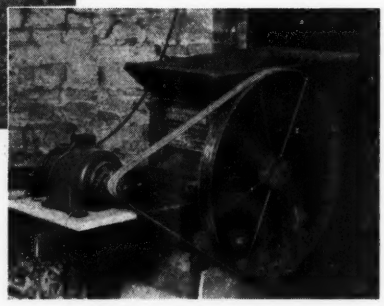
These grinding and crushing mills, varying in speed between 350 and 550 RPM, are ideal for direct driving by electric motors, often through vee flat belts, with very close centres, making a very compact drive. In such cases totally enclosed or fan-cooled motors should always be used owing to the dusty nature of the products and the proximity of the motor to the mill. If the purse will run to it, and complete freedom from damage and cleaning is desired, fan-cooled motors should be installed throughout the premises.

In an article by Mr. H. W. Grimmitt in the ELECTRICAL REVIEW of June 7th, stress was laid on the use by farmers of their own threshing machines. In the northern areas of England and in Scotland, threshing machines are to be found installed in very many farm buildings. Thus threshing can be carried out under cover and at times convenient to the farmer, the market and the stock requiring feed and bedding. These threshing machines range from 1 ft. 6 in. diameter to the standard 4 ft. 6 in. diameter machine. A 2 ft. 6 in. diameter machine driven by an 8-HP motor and producing 45 bushels of oats per hour would probably meet the requirements of all but the largest grain producing farms.

Some ten to twelve men and women are normally required to operate the average contractor's engine-driven threshing plant, upsetting the routine of both farm and house, whereas the work can be carried out with the farmer's installed electrical plant by three or at the most four people. If a chaff blower and grain elevator are installed, the work of these few people is made even lighter and more pleasant. Corn and seed dressing or winnowing machines are driven at constant speed by ¼- or ⅓-HP motors mounted on the machines and running about three hours for the consumption of 1 kWh and freeing expensive labour from a monotonous job.

For the dairy farmer, electricity is a great boon, as dairying is a seven day a week business, making it difficult to obtain and retain good workpeople. The milking machine frees labour and also allows unskilled labour to take over the work, except for stripping, and carries it out for approximately 2s. 6d. per cow per annum (with electricity at 1d. per kWh). The electrically-driven bottle washer is almost a necessity, while electric water heating (thermostatically controlled) is ideally suited to the dairy, a supply of hot water being available at all hours of the day and night, when it is often required for hot mashes for calving cows and sick animals. Electrically-heated sterilisers cut down the size of the dairy building and in addition eliminate all the dirt, dust, smoke and fumes associated with coal or other fuel-fired boilers.

Very often the water supply on a farm is not at all satisfactory, and automatically controlled electrically driven pumps are easily installed in place of oil-engine equipments. They are often installed to help wind-driven pumps, these being automatically controlled from the tanks in the farm buildings often up to 500 yards away. Where the water pressure is very low, ¼-HP centrifugal pumps can be employed to give additional pressure for hosing out byres and yards, and also to return the milk-cooling water to tanks for re-use. These small pumps will deal with about 1,000 gallons at a cost of 2d. or 3d., which is cheaper than purchased water.



Left: A portable universal bogie with countershaft and friction hoist in use on a haypole. Above: A neat friction hoist fixed to the rafters; note the flexible steel tube extension connecting the circuit tubing and the motor terminal box. Below: The portable motor illustrated on page 199 used for driving a root cutter

For years it has been pointed out to farmers that to progress they must light and use their buildings on factory lines.

(*Concluded on opposite page*)

PIEZO-ELECTRIC CRYSTALS

Work of the P.O. Research Organisation

In this I.E.E. paper the author suggests that the coil and condenser filter will eventually be replaced by the crystal resonator in wide-band and multi-channel carrier systems

HOW quartz crystals which have piezo-electric properties are prepared, and representative examples of the several ways in which they are used for controlling frequency in telecommunications apparatus, are described in a paper by Mr. C. F. Booth (radio branch, Post Office Engineering Department) which has been released by the Institution of Electrical Engineers. The paper is of wide scope, dealing with apparatus made by the author's colleagues of the P.O. research organisation at Dollis Hill and representing the results of many years' work on production processes by the crystal laboratory staff.

Following an outline of the structure of crystals and the piezo-electric properties they develop when subjected to mechanical stress, Part I is concerned with oscillators. Some of the many types of plates cut from crystals are described, together with several kinds of crystal holders. Part II discusses resonators and some of their uses for frequency measurement and selection, which may be an even wider application than the oscillator for control purposes, making practicable the design of radio-frequency filters with band-width and frequency characteristics which cannot be realised at present with coil and condenser elements. The actual degree of excellence obtainable is chiefly dependent upon the crystal mounting.

The development of crystal filters has made possible multi-channel carrier systems of the type employed on the London-Birmingham-Manchester coaxial cable. The P.O. is mainly concerned with crystal filters within the 40 to 700 kc/s range, their manufacture and mounting for use outside this range being somewhat difficult. The design of crystal filters is not considered by the author, who merely outlines their applications and the performance of representative examples.

Part III is concerned with the selection and testing of raw materials, their cutting and lapping, and plating their holding electrodes by the cathodic sputtering of platinum or gold, or coating them with aluminium by the evaporation process. The quartz referred to in this paper comes mainly from Brazil.

Adjustment and Testing

The final adjustment and testing of crystals are exceedingly skilled operations, proficiency being attained only by experience, but a large number of similar crystals may be fashioned by bulk production methods. One batch of several hundreds made at Dollis Hill had to possess a frequency/temperature coefficient of less than two parts in 10^6 per deg.C. within the 20 to 55 deg.C. range and the oscillator frequency in the standard circuit had to be within plus or minus one part in 10^6 of the specified frequency of 1,000 kc/s. The magnitude of the order made it economical to design special direct reading frequency meters accurate to within plus or minus 0.5 part in 10^6, as well as rapid operating ovens and jigs and tools to facilitate all stages of the work.

The general economic aspect of the subject is very involved, but the author's opinion is that the coil-and-condenser type of filter will eventually be replaced by the crystal resonator type in all wide-band and multi-channel carrier systems.

Future developments will be concerned mainly with the speeding-up of the production process and with the more economical use of raw quartz, but it is considered that the final adjustment and testing will remain a skilled manual operation. Material cost is small, the major expense being the labour charges, but it is not easy to obtain high-grade crystal.

Much remains to be accomplished with regard to the determination of the amount and type of twinning which may be permitted in a plate. Whereas the presence of extensive electrical twinning renders a plate unusable, the effect of the two optical varieties is not fully appreciated. Although twinning may not seriously disturb the oscillation property of a plate, its presence may be reflected in the frequency constant. Thus, if plates are made in bulk and some contain appreciable twinning it may not be practicable to adjust the frequency-determining dimension very close to the final value in the bulk process because of the risk that the frequencies of the twinned plates may be above the specified value.

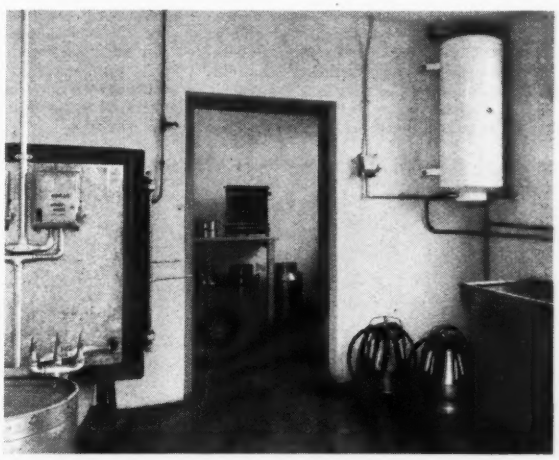
The present technique permits of the determination of the axes within limits which are sufficiently close for normal purposes, and it is doubtful whether the application of the X-ray spectrometer would expedite the process, although it would perhaps improve the accuracy. It is thought that any advance will be concerned with the development of universal fixtures in which the work will be oriented to facilitate the cutting and lapping of *Z*, *X* and *Y* planes.

Several available saws for cutting quartz crystals all possess the "long-life" property, but up to the present they have all failed to give the desired cutting accuracy. The solution appears to lie in the use of a hard steel disc, to give stiffness, with a softer deposited rim containing the diamond charge. The effective cutting rate can be accelerated by the use of precision ganged saws capable of producing three or even four slices. Improved universal fixtures will enable the raw crystals to be cut into slices with the minimum amount of preparatory cutting.

Improvement of the parallelism of the plates from the cutting machine and of their closeness to the final dimensions, will result in a marked reduction in the duration of the lapping process. Present experience indicates that resonator plates will be produced direct from the machines except for the final adjustment of the frequency-determining dimension. In the bulk supply of plates automatic lapping will be employed.

Farming in Wartime (*Concluded from page 200*)

In the best farms, cattleyards, stableyards and stackyards are lit with high-powered lamps, thus allowing all kinds of work to be carried out in early morning and late afternoon throughout the winter. For instance, manure carts can be loaded up, cattle trucked for the market, threshing (either indoors or out of doors)



A 20-gal. water heater serving an electric steriliser and steaming stool

carried out and stall-fed cattle foddered. Thus the only delayed operation may be a late start in ploughing, but in the tractor shed the implements can be oiled and overhauled to advantage in readiness for daylight.

While a great deal of such lighting is not permissible in wartime, such as can be used becomes all the more important since the loss through not lighting farm premises, so causing the men to stand about during a large part of the winter doing nothing for want of good light, may be considerable. Now, as always, it can be said that agriculture cannot afford to be without electricity if it is accessible.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

MR. W. Dundas, deputy electrical engineer of Bradford, has been appointed electrical engineer at a commencing salary of £1,500, rising to £1,750, in succession to the late Mr. T. Roles. Mr. Dundas has been at Bradford for the past ten years, having previously been at Manchester. Five years ago he rendered valuable service on the occasion of the fire at Bradford power station. The Electricity Committee has decided to advertise for a successor to Mr. Dundas and also for a commercial manager.

Mr. H. C. Godsmark, general manager and engineer of the Huddersfield Corporation Passenger Transport Department, whose appointment as general manager of the Newcastle-on-Tyne City Council's transport and electricity undertaking we reported last week, received his early training at Loughborough College and the Brush Electrical Engineering Co., Ltd., Loughborough.

Mr. H. C. Godsmark

At the outbreak of the last war he joined the Forces, and served until 1918 with the Royal Engineers at Salonica, chiefly on the Headquarters Staff of the Salonica and Constantinople Railway. On his return to civilian life, he went to Cammell Lairds, Ltd., Nottingham, and then to the London County Council and the Manchester Corporation Transport Department. Then followed a period of service as deputy manager of the Nottingham Corporation Passenger Transport Department and finally as manager of the Huddersfield Passenger Transport Department and operating manager of the Huddersfield Joint Omnibus Committee.

At Nottingham Mr. Godsmark assisted Mr. Marks to complete the conversion from tramways to trolley bus operation and at Huddersfield he has been solely responsible for the complete conversion of the tramway system.

The Duke of Kent during his recent visit to Stoke-on-Trent and neighbouring towns inspected a detachment of the various Civil Defence Services. Our photograph shows him chatting with Miss Bentley, of the Stoke-on-Trent Electricity Department, who has served as a volunteer officer in charge of a report centre since the beginning of the war. Mr. T. Lockett, manager of the Electricity Department, is deputy A.R.P. controller.

Miss Josephine Eades, daughter of Mr. T. A. Eades, managing director of the Automatic Telephone and Electric Co., Ltd., has been married to Lieut. Lee Morgan.

St. Marylebone Borough Council Electricity Committee reports that **Mr. F. Selley,** the chief electrical engineer, has expressed a desire to retire on superannuation after thirty-six years' service with the Council. In view of prevailing conditions, the committee recommends, however, his reappointment for another year at a salary of £1,200.

Ex-Alderman J.W. Longley, for many years chairman of the Bradford City Electricity Committee, has been presented by his friends with a silver candelabrum as a mark of their appreciation of his services.

Admiral H. W. Grant, who, as we reported last week, is the new chairman and managing director of Marconi's Wireless Telegraph Co.

Mr. E. C. Scutt, of the Croydon Electricity Dept., has been appointed mechanical maintenance engineer to the West Midlands Joint Electricity Authority. The Authority has decided not to proceed with the appointment of a maintenance foreman.

We were interested to read in *The Times* of the birth of a son to the wife of **Mr. Denis Z. de Ferranti,** younger son of the late Dr. S. Z. de Ferranti and a director of Ferranti, Ltd.

Mr. W. Glass, A.M.I.M.E., has been appointed a director of Johnson & Phillips, Ltd.

Mr. R. H. Mace has been presented with a silver tankard and tools, and with a silver butter dish for Mrs. Mace, to mark his retirement on December 31st from Central London Electricity, Ltd. He joined the St. James' & Pall Mall Co., Ltd., in 1909 as charge engineer and reached the position of chief engineer in 1934.

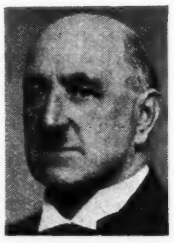
The Duke of Kent chats with Miss Bentley at Stoke-on-Trent

Professor Ernest O. Lawrence, of the University of California, has been awarded the seventeenth Duddell Medal by the Physical Society in recognition of his invention and development of the "Cyclotron."

Obituary

Mr. H. V. James.—The death occurred recently of Mr. H. V. James, managing director of Witton-James, Ltd., the company which he founded in co-operation with Lord Hirst over thirty years ago. Mr. James was responsible for many developments in the application of electricity to printing.

Mr. W. Innes.—We regret to report the death, on December 22nd, of Mr. William Innes, A.M.I.E.E., A.M.I.Mech.E., who was formerly managing director of the Westminster Engineering Co., Ltd., of Willesden. Mr. Innes was sixty-two years of age and had been ill for some time.



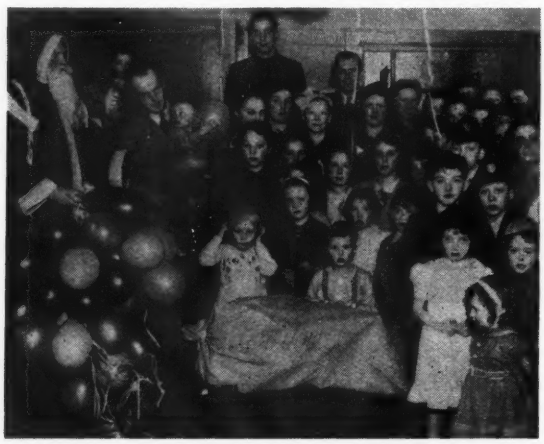
The late Mr. W. Innes

Mr. Innes served his time with Mavor & Coulson, Ltd., and was subsequently on the staff of Drake & Gorham, Ltd. In 1898 he was appointed station engineer to the Glasgow Corporation, afterwards becoming deputy chief engineer at the Poplar electricity works. He later became a partner in the firm of Towler & Innes, of Bow, and joined the Westminster Engineering Co., Ltd., as a director in 1921, later becoming managing director.

Mr. R. A. Giffen, managing director of Giffens, Ltd., electrical engineers, St. Albans, died on December 12th. He had been in business in the town for thirty-four years.

Mr. W. A. F. Stewart.—The death is reported of Mr. W. A. F. Stewart, a director of Thermotank, Ltd.

Mr. A. Liversidge.—The death occurred recently of Mr. Alfred Liversidge, of Huddersfield, who had been in business on his own account as an electrical engineer since 1907.



On December 21st, Moffats, Ltd. gave a Christmas treat. Here "Father Christmas" is shown handing a balloon held by Mr. T. L. Moffat, the managing director, to one of the children present

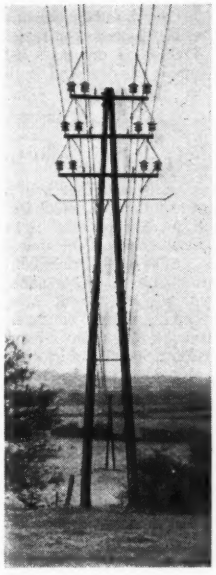
TRIPOLE CONSTRUCTION

Support for Heavily Loaded Lines

By J. L. Gaved

A form of support designed to meet emergency conditions is considered suitable for employment in more normal circumstances

THE development from the familiar "A" pole described in this article is believed to be new to this country. Its designation as a "tripole" distinguishes it from the three-member pole of triangular assembly frequently utilised at circuit junction points. Its introduction was due to the restricted sizes of poles available—an emergency product in effect—but having proved its merits, it may find scope as a support for heavily loaded lines which require abnormally high poles.



Ordinary "A" pole before—

Composite poles are not favoured under normal conditions; they offer too many pockets in which rain may collect; they also require maintenance of bolts and scarf blocks, which slacken as the timber "weathers."

The poles which are shown in the photographs suffer from these restrictions, each member being made up of two lengths scarfed at the midpoint with iron ring clamps above and below the joint. Each one is 50 ft. long and 11 in. in diameter at a distance of 5 ft. from the butt.

The line supported is a double-circuit 0.10 sq. in. copper 33-kV design which incorporates a 7/9 SWG aerial earth wire.

At the apex of the tripole the usual key-block and cramping bolts are fitted. At the base two cross baulks with uplift baulks at each extremity are fitted, the middle leg being scarfed to rest between the cross baulks; a through bolt is provided to give the necessary additional support. The foundation is therefore substantial and proportionate to the individual loadings imposed. The introduction of the third leg is primarily of advantage in withstanding stresses "in the line" rather than transversely in regard to the foundation of the structure.

Augmented Transverse Strength

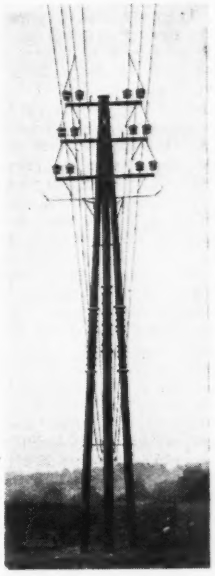
Farther up, at the tie-bars and at the peak, the augmented strength of the assembly transversely becomes appreciable; it is calculated that it amounts to the value of an equivalent single pole 50 ft. by 11 in. set 6 ft. 6 in. in the ground. It has, moreover, a stiffening tendency upon the "A" pole in resisting the effects of dead weight loads. This will be apparent from the photograph of the "A" frame prior to the middle leg being fitted. The load in this instance is that of unloaded conductors; imagination will supply the comparison with ice-loaded wires and poles in producing a distinct bowing outwards of the pole's members.

In making a comparison between the "A" pole and the extended tripole, the value of the foundation to resist transverse loads is not increased in the conversion, but dead weight capacity is increased 50 per cent.; resistance to wind pressure on the wires acting along the exposed portion of the poles is similarly greater, while resistance to fractures under broken conductor conditions "in the line" gains in a similar manner.

The last-named advantage is of value when these poles are situated at road crossings or railway crossing points. Hence the appearance of the poles which are illustrated in the accompanying photographs as part of a line comprising normal "A" poles.

Elastic Foundation

Providing the three members of the tripole cannot move relatively to one another this type should provide a means of utilising short poles of small diameter economically to provide an equivalent high structure of considerable value in overhead line constructions.



—and after reinforcement

The essential design must, however, permit foundation failure in the event of overloading, *not* the immovable anchorage to the ground, assumed in formulæ. Unyielding foundations presage the cracking up of any pole under storm stresses unless it is a flexible unit (which no composite structure can aspire to become), as the trees bear witness.

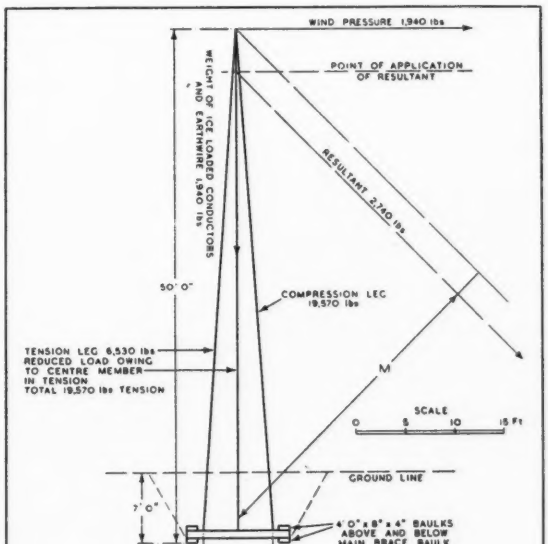

WIND PRESSURE 1,940 lbs
POINT OF APPLICATION OF RESULTANT
WEIGHT OF ICE LOADED CONDUCTORS AND EARTHWIRE 1,940 lbs
RESULTANT 2,740 lbs
50'-0"
COMPRESSION LEG 19,570 lbs
TENSION LEG 6,530 lbs REDUCED LOAD OWING TO CENTRE MEMBER IN TENSION TOTAL 19,570 lbs TENSION
M
SCALE
0 5 10 15 Ft
GROUND LINE
7'-0"
4'-0" x 8" x 4" BAULKS ABOVE AND BELOW MAIN BRACE BAULK
7'-0"

Diagram of stresses in tripole. Effect of middle leg is to relieve shear at apex. Compression leg obtains no relief

Soil resistance 2,000 lb. per sq. ft. per foot depth. Overturning moment 82,200 lb.-ft. Foundation resistance 123,000 lb.-ft. Factor of safety 1.5

Power Station Fires

METHODS of guarding against the risk of fire in power stations were outlined in a paper read before the Irish Centre of the Institution of Electrical Engineers in Dublin by Mr. P. G. Boyd (Electricity Supply Board) on December 19th.

After mentioning the principal risks, Mr. Boyd said that they could be reduced by keeping all insulating parts clean and regularly testing them. All plant should be kept in good mechanical condition to prevent failure in service. Adequate automatic relay protection was one of the best safeguards, but effective fire-extinguishing equipment should always be installed.

NEW BOOKS

Electricity in Ships. A.C. Motor Manual. Vibration in Machinery

Electricity Applied to Marine Engineering. By W. Laws, M.Sc., A.M.I.E.E. Pp. 276; figs. 135. The Institute of Marine Engineers, The Minories, London, E.C.3. Price 5s. 6d.

There is no need to impress upon readers of the Electrical Review the importance of electricity to the marine engineer, since the books of "Rules" simultaneously published by the Institution of Electrical Engineers and Lloyds' Registry of Shipping, to which attention was recently drawn in these pages, gave the specifications of the equipment to be used for such purposes as lighting, operating the auxiliary machinery and so on.

It follows that engineers must be trained to operate and maintain this equipment, and this excellent little book sets out to do so. It is based upon a series of articles contributed by the author to the "Transactions" of the Institute of Marine Engineers to cover the syllabus of the electrical section of the Board of Trade examination for the chief engineer's "ticket." The book is not, however, so much a survey of the peculiar problems associated with the use of electricity on board ship as a study of the fundamental principles underlying the generation, distribution and utilisation of electricity for any and every purpose.

To that extent it can be recommended to students of technical colleges as well as to junior marine engineers. Indeed, it may be confidently recommended to all engineers who, because of a lack of earlier technical college training, find the treatment given in the majority of textbooks rather over their heads owing to the generous use of higher mathematics. This applies particularly to the chapters dealing with AC, although throughout the book the treatment is essentially practical. The marine engineer might, perhaps, query the necessity for devoting four chapters to AC, in view of the fact that, so far, AC finds but few applications on board ship, particularly as the author, while giving a chapter on Diesel-electric propulsion in which DC is used, does not mention turbo-electric propulsion in which AC is generally employed. But apart from this, we have nothing but praise for this excellent little volume, and in view of the fact that the holding of a B.O.T. marine engineer's ticket is considered a good recommendation for power station engineers, it merits a wider public than that to which it is specifically addressed.—A. R.

AC Motors and Control Gear. By C. H. Claude Cooke. Pp. 88; figs. 20. Crosby Lockwood & Son, Ltd., Stationers' Hall Court, London, E.C.4. Price 3s. 6d.

The development of the grid system of electricity distribution in this country has perforce led to the wide adoption of the alternating current motor for driving the many differing kinds of machinery used in modern industry. The result is seen in the development of a number of diverse types of AC motor each possessing its own distinctive characteristics.

The practical engineer—particularly if, before the coming of the grid, he had dealt only with DC machines—may be forgiven if he finds the field in which he now has to work somewhat confusing and he should, therefore, welcome this little book since it affords a complete survey of all the different types that can be included under the general heading of industrial AC motors. Not only does the author include the fundamental forms usually described under the titles of synchronous and induction motors, but he gives details of the slip-ring and commutator types and of the various means whereby high starting torque is obtained as, for example, with the Boucherot rotor.

The extensively used fractional horse-power motor is also dealt with, and the problem of the starting and control gear as well as the necessary protective devices for each of these different types is very clearly discussed. Particular attention is also given to the installation of AC motors, not merely with a view to conforming to the regulations laid down by the Institution of Electrical Engineers (the essential regulations are included by permission of the I.E.E.), but also so that taking the equipment as a whole the power factor may be kept as high as possible.

It is, perhaps, to be regretted that space could not be found for a brief description of some of the fundamentals of alternating current theory such as inductance, impedance, power factor and so on, particularly as it is suggested that the book has been written for, among others, the student and the apprentice; but taken in conjunction with an elementary knowledge of AC theory the book should make a wide appeal. In any case, the author is to be congratulated on having squeezed such a wealth of information into so small a compass, as also are the publishers for issuing so valuable a work at so low a price.—A. R.

Practical Solution of Torsional Vibration Problems. Vol. I. By W. Ker Wilson, Ph.D., M.Sc., Wh.Ex., M.I.Mech.E. Second edition. Pp. 731, illus. Chapman & Hall, Ltd., 11, Henrietta Street, London, W.C.2. Price 42s. net.

As to the importance of a study of torsional oscillations and of the application of its lessons in the design of modern machinery there is no question, and it may fairly be said that most designers are familiar with the underlying theory of the subject. It is in the sphere of its application that considerable development is required beyond the fundamentals, as the actual bodies the behaviour of which has to be analysed differ very materially in shape and disposition from the elemental shafts and discs on which the theory is primarily based. The problem, then, is how best to explain the several steps and investigations which have to be made in arriving at a solution of any one of a number of practical problems.

In his book, which is wholly directed to the end of providing suitable methods of solution of practical problems, Dr. Ker Wilson has adopted what will generally be recognised as the more direct and helpful method, namely, that of dealing with an extensive range of typical cases. In this way, the reader in search of specific information should find himself able to select data appropriate to his particular problem and, from these and from the method of solution presented, to build up a set of standard forms suitable for rapid reference.

There are examples here to satisfy the requirements in the fields of marine, electrical, aeronautical and automobile engineering practice. In electrical engineering the heavy rotating masses necessary for satisfactory electrical operation of generating sets direct-coupled to internal combustion engines render this type of installation particularly susceptible to disturbing vibrations. At several points in the book examples of this kind are dealt with and from the guidance given it should be possible to make sure that no critical disturbing amplitude occurs near the operating speed.

The new edition includes several important changes, among which is a more comprehensive treatment of flexible couplings and additions to the subject matter relating to geared systems and that dealing with fatigue phenomena. The vibration measuring instruments described include the latest electrical types and there is an extended discussion of instrument theory and calibration.—J. A. C.

Electrical Contacts. By G. Windred, A.M.I.E.E. Pp. 403; figs. 130. Macmillan & Co., Ltd., St. Martin's Street, London, W.C.2. Price 16s.

Mr. Windred has collected together a considerable amount of data on electrical contacts. His book is divided into eight chapters dealing, respectively, with electrical contact phenomena, joints in electrical conductors, switch contacts, circuit phenomena, arcs and discharges, suppressors of arcs, contact materials and sliding contacts. These chapters form an up-to-date compendium of information primarily of interest to the heavy current side of the industry, those on switch contacts, arc suppressors and contact materials being perhaps the most comprehensive. The bibliographies at the end of each chapter will prove valuable.

The telecommunication specialist on contacts will find very little information of a new or original nature and the subjects of prime importance to him, such as carbon granular contacts and, under sliding contacts, the phenomena taking place in automatic telephone switching mechanism, are only barely referred to. In the section on joints in electrical conductors there is no reference to the jointing of bare wire conductors used externally either for heavy currents or for telecommunication purposes.

The study of contact surfaces by means of the electron microscope which is likely to be of profound importance in the elucidation of effects not clearly understood is not mentioned, but so far little or nothing has been published in this connection. A particularly valuable contribution to circuit phenomena has recently been published as a Bell Telephone System monograph (B. 1202), "Contact Phenomena in Telephone Switching Circuits," an investigation of phenomena at contacts carrying weak currents by means of the latest types of glass-envelope cathode-ray oscillograph tubes, by A. M. Curtis.

The telecommunication engineer will, however, find a considerable amount of information collected together from many sources which should prove of great value to him, and for the heavy current engineer the book will provide the only comprehensive manual in the English language dealing with electrical contacts.—B. C.

Shorter Notices

The Dry Battery. By Waring S. Sholl. Pp. 74; figs. 20. Charles Griffin & Co., Ltd., 42, Drury Lane, London, W.C.2, Price 2s. 6d.

Elements of Acoustical Engineering. By Harry F. Olsen. Pp. 344; illustrated. Price 30s. Chapman & Hall, Ltd.

Science versus Materialism. By R. O. Kapp. Pp. 280. Methuen & Co., Ltd., 36, Essex Street, London, W.C.2. Price 10s. 6d.

Experimental Radio Engineering. By E. T. A. Rapson, assisted by E. G. Ackermann. Pp. 143; figs. 168. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, London, W.C.2. Price 8s. 6d.

HIGH-TEMPERATURE STEAM

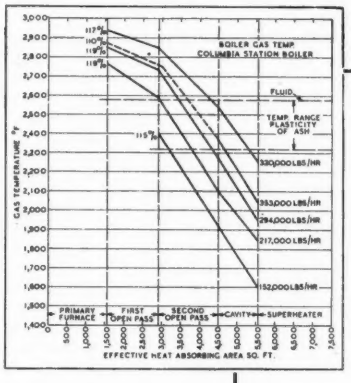
Methods of Control

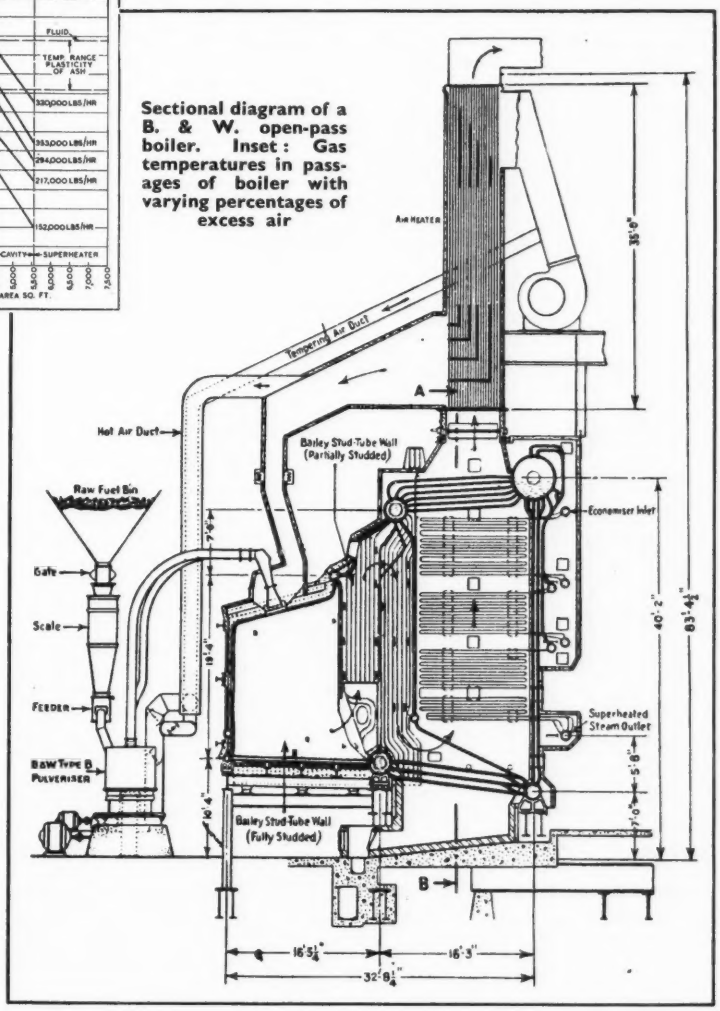
By Vernon Walker, A.M.I.E.E.

The author discusses the factors which influence steam temperature and the way in which this is controlled to prevent damage to the superheater and turbine

THE control of superheated steam temperature is affected by many variables. These include boiler rating, excess air, feed-water temperature and flow, boiler-drum level, drum-water concentration, slagging of heating surfaces and operation of soot blowers. Some means of control is necessary not only to obtain a flat superheat-load characteristic, but also as a positive means of limiting maximum steam temperatures in order to avoid damage to the high-temperature part of the superheater and to the turbine. The creep of the metals used in turbine construction is apt to double for each 20 deg. F. above the designed steam temperature when this is more than 800 deg. F.

The predominant location of the superheater is behind the first few rows of boiler tubes, but in some instances a portion of the superheater is in the first boiler bank where it receives some radiant heat. With higher steam pressures and temperatures, the superheater may have between 12 and 20 per cent., or even more, of the total boiler heating surface, depending on its location, and absorb between 15 and 20 per cent. of the total heat reclaimed, while the part of the boiler that consists of the first bank of tubes may have only 5 or 6 per cent. of the surface absorbing a like percentage of the heat. The furnace walls may comprise 5 or 6 per cent. of the surface, and absorb nearly half of the heat realised by the entire installation. As the proportion of heat absorption by furnace surfaces increases, the accumulation of slag and ash on those surfaces becomes more noticeable in its effect upon steam temperature.





Sectional diagram of a B. & W. open-pass boiler. Inset: Gas temperatures in passages of boiler with varying percentages of excess air

With a plain convection superheater, increase in boiler rating causes superheater temperature to increase by an amount which depends on the amount of boiler heating surface separating the superheater from the furnace. A convection superheater well removed from the furnace will show a rapid increase with higher boiler ratings, but if it is nearer the furnace the curve will flatten. Radiant superheaters in the furnace will give a lower superheat with increase of rating; hence by combining the radiant and convection designs in the same boiler, a comparatively flat superheat curve may be obtained. Unless the superheater is of the strictly radiant type, the steam temperature will also increase with a greater excess of air in the products of combustion, since the gas temperature in the boiler tube bank is not reduced so much as with a lower percentage of excess air.

The further back the superheater is from the furnace, the greater the effect of the amount of excess air. For example, with an interdeck superheater separated from the furnace by about 15 per cent. of the boiler heating surface, a change in excess air from 20 to 40 per cent. will increase the superheat by approximately 10 per cent., with a decrease in overall efficiency of about 2 per cent. If gases pass over 40 per cent. of the boiler heating surface before reaching the superheater, as in the older designs, the superheat will be increased some 20 per cent.

Raising the feed-water temperature to the boiler decreases the superheat for a given rating, as it increases the steam flow through the superheater with no corresponding change in gas flow. With feed-water inlet temperatures ranging between 170 and 340 deg. F., a variation of 10 deg. in feed water temperature causes a change in superheat of approximately 1 per cent.

The effect of initial moisture in the steam becomes serious at high superheat temperatures. At 250 deg. F. the superheat is reduced approximately 14 per cent. by 1 per cent. of moisture. To prevent carry-over of moisture and impurities with the steam, and consequent fouling of the superheater tubes, steam scrubbers are fitted in high-pressure high-capacity boilers. Steam purity is affected by the concentration of dissolved solids in the boiler water and the rate of chemical feed to the boiler and in some cases is obtained only by maintaining the dissolved solids at a low percentage.

With increased heat absorption due to higher steam temperatures, the superheater has become two to three times larger than when generating steam at 550 to 600 deg. F., and control of superheat becomes correspondingly more difficult, especially with regard to the ash content of the coal and consequent slagging of the heating surfaces. When the surface of a water-cooled furnace is clean, the final steam temperature may be 70 to 80 deg. lower than when the walls are covered with slag. To control the final steam temperatures, it has been necessary with certain classes of fuel to cover part of the furnace wall tubes with refractory in order to raise the superheat by providing a permanent hot wall surface in place of the variable slag surface. It is a characteristic of bare water-cooled furnaces that when the rating is reduced, the walls tend to clean themselves of slag, thus reducing the temperature of the gases entering the boiler bank and consequently the final steam temperature.

Air Percentage and Gas Temperature

These remarks are illustrated by the accompanying sectional diagram of a B. & W. open-pass boiler for steam conditions of 770 lb. per sq. in. and 910 deg., which has recently been placed in service at a large station in the United States. At a maximum evaporation of 353,000 lb. per hr. the gas temperatures are lower than those at 320,000 lb. per hr., due to the reduction of the amount of total air used for combustion. The percentage air measured at the outlet of the second pass for the maximum rating was 110 per cent., while that for the 320,000 lb. per hr. output was 117 per cent. This relation of air percentage to gas temperature is important in the control of steam-outlet temperature and ash and slag accumulations in the boiler passes. The ash in the coal fired has an initial deformation temperature of 2,325 deg. F., and a fluid temperature of 2,575 deg. F. At more than 152,000 lb. of steam per hour, the ash is at or above the fluid temperature up to the outlet of the first open pass. All the furnace walls up to this section are self-cleaning, deposited ash being continually removed as molten slag.

There are three methods generally employed in controlling superheat:—(1) To provide an excess of superheater surface to give the desired final temperature at low ratings, with provision for cooling the steam at high ratings; (2) to control the quantity of flue gases passing over the superheater; (3) to employ convection and radiant superheaters in series. The first method has no measurable influence on the boiler efficiency, but the second affects the efficiency depending on the position of the damper in the boiler setting.

Either the spray or surface type of desuperheater is used, usually interposed between a primary and secondary section of the superheater or alternatively situated at the outlet of a single superheater. With the former arrangement, the maximum steam temperature obtained at any point in the superheater circuit does not exceed the final outlet temperature. In a recent development a portion of the steam is cooled by passing it through tubes placed in a submerged boiler drum. In this case an intermediate superheater header is equipped with a division plate containing adjustable orifices. The steam flows through the orifices on its way from the low- to high-temperature sections, and is reduced by some 15 lb. per sq. in.; the pressure difference thus created between the inlet and outlet sides of the intermediate header is sufficient to ensure a limited flow of steam from the inlet side of the intermediate header through the cooler tubes in the boiler drum and a flow-control valve into the outlet side of the intermediate header. The quantity of steam flowing through the cooling tubes is controlled by the desired final steam temperature. The steam after passing through the cooling tubes mixes with the steam flowing through the orifices of the header division plate, and all steam passes through the high-temperature superheater elements.

Gas Volume Regulation

Control by regulating the volume of gases passing over the superheater may be classified as divided-pass, straight by-pass damper, and unbalanced superheater type. In the divided-pass type, a baffle divides the boiler setting into two sections; when the baffle extends from the front to the rear (as in the boiler illustrated), the superheater extends only for the width of the section in which it is placed, *viz.*, three-quarters of the width of the boiler setting, the other section being occupied by the economiser. When the baffle is parallel with the drum, the superheater extends entirely across the setting.

Dampers placed at the outlet of both boiler sections permit gas flow across the superheater to be controlled as desired. The dampers in this case are in a comparatively cool zone of between 700 and 800 deg. In the straight by-pass type, the damper is in effect merely a gate in a baffle which separates adjacent gas passages. Usually the opening of the damper allows gas to by-pass most or all of the superheater and to enter a boiler pass through which it would flow after normally sweeping over the superheater. In some instances, for convenience of design or access, part of the boiler surface beyond the superheater may also be by-passed. Temperatures up to 2,000 deg. F. are often maintained in the region of by-pass dampers near superheaters, and for such dampers either refractories or special chrome-nickel-iron alloys are being used.

The unbalanced superheater employs superheaters of different areas, the flow through two sections of a twin-type boiler being regulated by dampers on the outlets of the boiler setting.

A flat superheat-load curve can be obtained by a combination of radiant and convection superheaters in series. The radiant section is generally placed in the side wall of the furnace and the convection superheater located in the conventional manner. Nearly equal heat absorption of superheaters having reciprocal characteristics results in a practically constant superheat throughout a 4 to 1 load range. There does not, however, appear to be a wide adoption of radiant superheaters corresponding to increased steam temperature.

Another design to meet superheat control requirements is to divide the furnace vertically by a water wall, one section being cooled on all sides by water walls, and the other partly by water walls and part by a panel of radiant superheater elements in one side wall. The radiant section is connected in series with a convection superheater. When starting up, coal is burnt in the water-cooled furnace. At low rates of steaming, when the superheat given to the steam by the convection superheater is reduced, the superheater furnace is fired more intensely. As the rate of steaming increases, the proportion of coal fired to the water cooled furnace is increased until at maximum output the coal fired is the same in both furnaces.

Automatic features are applied to both the desuperheater and damper type of control. In the spray type of desuperheater, a thermostat controls the amount of water to the nozzles; in the surface type, the control operates butterfly dampers which by-pass a portion of the steam through the desuperheater.

Automatic damper control has been successfully applied when the loads do not fluctuate too rapidly or extensively, and under normal rates of change the steam temperature can be held to plus or minus 10 deg. F. A two-element automatic control has been developed for very close regulation on changing loads. The scheme provides initial impulses to change the position of the dampers with load change with later correction by thermostat.

Power for Aluminium

ACCORDING to the *Electrical World*, the production of aluminium has become the first—and to date only—major concentrated demand for electric power of the expanding national defence programme of the United States. Recent developments indicate that the Aluminum Co. of America, probably already the greatest single power user, by mid-1942 will be using at least one million HP of generating capacity for its combined normal and defence operations.

Provisions made only last June to expand the Tennessee Valley Authority to provide additional power for the expected increased need for aluminium already have proved far short of meeting now-anticipated demands for the metal. As a result the Defence Commission has announced that the Aluminum Co. is planning three additional units for its plant at Bonneville, to use 100,000 kW of power from the Bonneville-Grand Coulee pool.

The Nantahala Power & Light Co., a subsidiary of the Aluminum Co., has filed with the Federal Power Commission a declaration of intention to construct a large hydro-electric project on the Little Tennessee River near Fontana, Tenn. Both these projects are in addition to the contract already announced by which the T.V.A. will supply the Reynolds Metals Co., soon to enter the aluminium production field, with 20,000 kW of firm and 40,000 kW of secondary power, and to the allocation of 65,000 kW of the T.V.A.'s new defence power to the Aluminum Co.

The proposed hydro project would consist of an earth and rock-fill dam having a crest length of 1,750 ft. and a maximum height of 470 ft., a reservoir with one million acre-feet of usable storage, two 26-ft. diameter main tunnels with two penstock tunnels. The power house would have four units of 50,000 HP each, operating under a gross head of 426 ft.

COLOUR TELEVISION

A Demonstration of recent Baird Developments

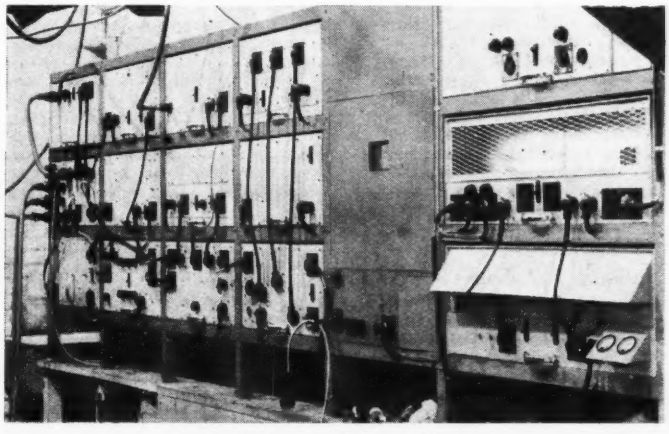
TWELVE years ago, in anticipation of the establishment of the regular London television service, Mr. John Logie Baird demonstrated his system to Post Office representatives and British Broadcasting Corporation officials. In the same year, for the first time, he showed television in colour to certain members of the British Association for the Advancement of Science. Ten years later he utilised a receiver screen measuring 12 by 18 ft. at the Dominion Theatre in London before an audience of 3,000 people, the transmission then being by wireless means from the Crystal Palace, eight miles away. Two years ago Mr. Baird began to employ a cathode-ray type of receiver for reproduction in colour.

For the demonstrations so far mentioned all the apparatus used was classed as experimental. Mr. Baird, however, seems to have developed colour television to a commercial stage at which a home-receiver screen measuring 2 ft. 6 in. in length by 2 ft. in height becomes a reasonably feasible expectation. It is believed to be the largest ever produced for ordinary household purposes.

Scanning Method

Most colours result from the combination in varying proportions of the red and green and violet (or blue) components, which are defined as primary because they cannot be imitated to the eye by the mixture of secondary colours, which when mingled again produce tertiary greys. This principle is made use of in printing and still and motion photography, separate pictures of each of several colour components being so superimposed as to blend into each other. Television in colour is achieved somewhat similarly by transmitting pictures in two colours only instead of three in sufficiently rapid succession to enable the sense of vision phenomenon to cause them to be perceived as a single image of hues very nearly approximating to those of the original.

The commonly accepted colour theory due to Young and Helmholtz postulates that there are three sets of optic nerves by which colours are appreciated. They are respectively deemed to be responsive to the red and green and blue constituents of light-energy radiation. It should be observed, however, that these are not the three primary colours: they would more accurately be described as the three fundamental sensations, so that the colour impression made on the brain by any particular object simply depends upon the proportion in which the three sets of nerves are excited by the three kinds of light rays that are being reflected back into the eye from the object.



A part of transmitting equipment

The method of transmission is based on Mr. Baird's original spot-light system, and 600-line scanning has been adopted, which is 50 per cent. more lines than was in pre-war use for the B.B.C. black-on-white service and comparing with 343 lines favoured in the U.S.A. The cathode-ray beam is projected through a two-colour filter in the form of a disc that revolves between the cathode tube and the optical lens which directs the moving spot of light on to the object, person, or studio scene being "televised."

Mr. J. L. Baird beside his latest colour television receiver

Scanning is thus accomplished by a traversing light spot that is continually alternating in colour from blue-green to orange-red in quick succession. The impinging light is thrown back by reflection from the scene on to three large photo-electric cells, which convert this luminous input excitation into electrical output currents. The latter are amplified, constituting the signalling impulses for transmission by wire or wireless.

Quality of Reception

The receiving apparatus functions in a similar manner. The received impulses are translated from a teleradiogram form with the aid of a cathode-ray tube whose moving beam is likewise directed through a two-colour filter disc. The black-on-white picture elements are thus re-coloured correspondingly to the transmitting sequence before passing through an optical lens that focuses them on to a mirror which projects them by reflection on to the large vertical ground-glass viewing-screen. The two light-filter discs are caused to revolve exactly in step by controlling their respective driving motors by means of synchronising impulses incorporated in the transmission signals, which in recent demonstrations have been conveyed by land line.

The receiver is a multi-purpose set, designed for black-on-white television as well as reproduction in colour. It also incorporates an all-wave broadcast radio receiver in the top left-hand corner and an automatic record-changing radiogramophone on the right-hand side. The cabinet is 5 ft. by 5 ft. by 3 ft. deep, the unusual size of the central viewing screen above the loudspeaker grilles no doubt contributing materially to the really good results achieved. Incidentally a stereoscopic effect appears to be associated with the coloured pictures that adds depth of focus. Also the complementary colour phenomenon, which creates the sensation of "white," is quite prominently observable. Reproduction is over life size in the case of head and shoulders views and differentiation between shades of colour of a lady demonstrator's auburn hair and red lips and multi-coloured embroidery on her frock is unmistakable.

COMMERCIAL and INDUSTRIAL NEWS

November Electrical Exports. Non-Ferrous Metals Control. Battery Prices

Technical Officers for the R.A.F.

VACANCIES exist in the Royal Air Force for technical officers for employment on engineering, armament and signals duties. Holders of electrical engineering or science degrees with experience of wireless, or holders of technical college or approved institution diplomas and two years' experience in telecommunication engineering (preferably on the radio side) qualify for signal duties, while a number of posts is also available for candidates possessing a sound theoretical knowledge of elementary electricity and magnetism, of the principles of wireless telegraphic and telephonic communications and of transmitter circuits, modern wireless receiving apparatus, and apparatus for the measurement of high-frequency potentials and currents. Some practical experience in addition is desirable, and specialised knowledge in one or more of the practical aspects of telecommunications would be an asset. Commissions in the R.A.F.V.R. will be granted for the duration of hostilities to suitable applicants between the ages of twenty-one and fifty possessing the requisite personal and technical qualifications. Candidates should apply in writing to the Air Ministry S.7 (e) 1, Adastral House, Kingsway, W.C.2, giving full particulars of their qualifications, training and experience. Those who are engaged on the production of aircraft, engines of accessories, or on other important national work should not submit applications without first consulting their employers as to the possibility of their being spared for R.A.F. duty.

Machine Tool Production

In a circular to machine tool and jig, tool and gauge makers, Mr. P. H. Mills, Controller of Machine Tools, says that he estimates that another 15,000 operatives, men and women, are required in the machine tool industry in this country as soon as possible. This means that for every ten employees another three should be trained and employed.

Overseas Trade in November

There was a further decline in the exports of United Kingdom goods during November as compared with the corresponding month of 1939 and electrical goods and apparatus exported also showed a decrease, being valued at £710,657, as compared with £915,770 in November, 1939. For the first eleven months of 1940 the value of shipments of electrical goods and apparatus was £12,396,804, as compared with £10,287,434 in January-November, 1939, and £12,309,402 for the first eleven months of 1938. Machinery (including electrical) exported in November was below the figure for November, 1939, the value being £2,050,266 (against £3,296,678).

Imports of electrical goods and apparatus in November were valued at £127,423, as compared with £228,853 in November, 1939, and the total for the first eleven months of last year is £2,989,519, as compared with £2,496,990 for January-November, 1939.

Repair of Damaged Business Premises

To assist owners of factories or other business premises, the Board of Trade has issued a leaflet bringing together all the necessary information as to steps to be taken to obtain materials to repair or licences to rebuild premises and plant damaged by enemy action. In view of the need for the greatest possible economy in the use of materials and labour, the leaflet tells owners that they can expect to be allowed to carry out only "first aid" repairs unless they are engaged upon essential work. Copies of the leaflet may be obtained through local authorities or direct from the regional licensing officers of the Ministry of Works and Buildings or from the regional officers of the Ministry of Health.

Period Fittings for Hotels

Two installations recently undertaken for the Liverpool brewers, Peter Walker & Sons, Ltd., form interesting examples in which G.E.C. fittings have been employed in such a way as to give efficient lighting while at the same time preserving the appropriate atmosphere. In the buffet bar of the "Rose and Crown," a fine Georgian hotel at Huyton, a series of five- and three- light bronze pendants have been installed. The illumination, provided through "Seloid" shades, is of uniform intensity, and accentuates the conventional lines of the room furniture and the bar, and effectively enhances the damask pattern of the wallpaper and the loftiness of the panelled plaster ceiling. For the other saloons fittings of a similar type, but incorporating a cut-glass bowl, have been fitted, together with a series of two-light bronze brackets to match.

The lounge bar of the Queen's Drive Hotel, Stoneycroft

The other installation, at the "Queen's Drive Hotel," Stoneycroft, is interesting for the manner in which the advantages of modern totally enclosed glassware bowls have been adapted for pendants of a period design. Sixteen large wrought iron pendants have been installed in the smoke room and lounge bar. The metalwork has an armour bright finish and features, the familiar fleur-de-lis and shield of the house of Tudor. The Economic Electric Co. was responsible for the electrical installation work at the first-named premises, and John Hunter & Co. for that at the other.

Electricity in Shelters

To draw attention to the necessity for having electricity properly installed in air-raid shelters, the Northmet Power Co. is inserting an advertisement in twenty local papers. The company is also issuing a leaflet containing recommendations regarding the installation work.

Limitation of Supplies

It is announced by the Board of Trade that the exemption from registration in any class of controlled goods of manufacturers whose trade in those goods is less than £100 a month does not apply to persons who commenced the business of supplying controlled goods of their own manufacture after July 23rd, 1940. Such persons must apply for registration however small their trade. There is no similar provision exempting small wholesalers. All wholesalers, however small their trade in controlled goods, are required to apply for registration in respect of all the classes of controlled goods which they supply to persons who buy for re-sale. The Board of Trade also emphasises that any transfer of quota under the Limitation of Supplies (Miscellaneous) (No. 5) Order, 1940, is invalid unless the Board's prior consent has been obtained.

Purchase Tax Decisions

Inquiries have been made whether it is open to a seller to allow his buyer a discount on the Purchase Tax. As there appears to be some doubt on this matter the Commissioners have issued the following statement for the guidance of registered persons:—The tax due from the seller to the Crown in respect of the sale must be calculated on the statutory wholesale value of the goods. This is a cash value and consequently any cash discounts which are available to buyers generally may be deducted from the prices by reference to which it is determined. But once the amount of tax due is thus determined it is an absolute figure independent of the actual discount earned in any particular case. It is this absolute figure which the seller is required by law to show on any settlement invoice or monthly statement issued to a retailer in respect of the sale, and which he must in due course pay to the Crown.

It has been decided that under Class 7, "*Lighting Fittings and Domestic Appliances, etc.,*" tax is chargeable at the rate of 33⅓ per cent. on radiators and convectors (steam, water, gas, oil and electric) but not chargeable on boilers for steam heating having a rating of 150,000 BThU per hour or over.

Non-Ferrous Metals Control

Commencing from January 1st, 1941, certain alterations are made to the arrangements set out in the Non-Ferrous Metal Control's circular letter of June 6th. The weight of copper and copper alloys to be used by any manufacturer in the production of the articles listed under paragraph (*b*) of that circular letter is to be restricted to 10 per cent. of the tonnage used by the manufacturer in the year ended June 30th, 1939. These articles comprise: electric water heaters of all types; wash boilers and washing machines (except motors); lamp holders (except inserts, terminals and contacts); conduit bushes, connectors and fittings of all types.

This 10 per cent. quota is granted for home civil trade. Requirements for export

and for Government Departments should be applied for separately and will be considered on their merits. It should be noted that the definition "Government Departments" in this particular instance is to be taken to include not only the Service Departments, *i.e.*, the Ministry of Supply, War Office, Admiralty and Air Ministry, but also all other Government Departments. The tonnage of metal obtained by a manufacturer during any one quarter of a year must not exceed one quarter of the annual quota allowed on the above basis. Apart from these alterations, the other restrictions and conditions set out in the letter of June 6th still apply.

Glass Substitutes for Factories

In November the Ministry of Labour and National Service made an Order requiring occupiers of factories in which more than 250 persons are employed to protect their workers from glass broken by bomb explosions. With this object glass is to be replaced by textile substitutes or covered with textile netting, muslin, cheese cloth or other textile materials. The general supply of these materials is limited by the Board of Trade arrangements for restricting home trade, some of them being cotton or rayon piece goods and others "lace." General licences have, however, now been issued by the Board of Trade which will enable the factory occupiers concerned to obtain unrestricted supplies of any of these textile goods required for compliance with the order. Separate licences and declaration forms are required for piece goods (S.R. & O. 1940, No. 2141) and for "lace" (S.R. & O. 1940, No. 2142). These are obtainable from any bookseller or direct from the Stationery Office.

The 1940 Heat Drop Tables

There was an error in the second column of our review of these tables on p. 162 of our December 20th issue. The figure 473.3 should be 483.3. It is clear from the following line that this was incorrect.

Canadian Excise Taxes

We recently reported that under modifications of the Canadian Excise Taxes on goods manufactured or imported into Canada, an excise tax of 25 per cent. was to be imposed on a number of electrical products. These, it is now announced, include electric lighting fittings and lamps and shades, globes and reflectors therefor; electric stoves, ranges, heaters, water heaters and refrigerators for household use; electric food choppers and grinders; irons and ironers; washing machines; garbage disposal units; floor waxers and polishers, all for household use; electric vacuum cleaners and attachments; grills, waffle irons; hotplates; roasters; kettles; chafing dishes; food and drink mixers and juice extractors; coffee makers; toasters of all kinds; portable humidifiers; curling irons, tongs, hair dryers and permanent waving machines; razors and shavers.

Australian Insulated Wire Duties

The Australian Commonwealth Minister of Trade and Customs has referred to the Tariff Board the question whether protective duties should be placed on enamelled wire, including textile covered, usually classed as magnet winding wire, from numbers 8 to 41 B. & S. Under the tariff item concerned articles are admitted free under the British preferential tariff, with the exception of a primage duty of 4 per cent. The intermediate and general tariffs are both 15 per cent., with a primage duty of 10 per cent. A Customs Special War Duty of 10 per cent. of the Customs and primage duties on all imports under this tariff item is leviable. Any United Kingdom firm or trade association interested in this reference to the Tariff Board should communicate at once with the Department of Overseas Trade, Millbank, London, S.W.1 (quoting Reference No. 15334/40).

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable Making Industry announces that the cost-of-living index figure on November 30th, 95 per cent. above the 1914 level, will not involve any alteration in wages on the third pay-day in January.

Torch Battery Prices

Under a new Order made by the Board of Trade, new maximum prices are fixed for batteries imported from Hong Kong, and the prices for batteries imported from countries other than the United States, Canada and Hong Kong are slightly increased. The new maximum prices fixed for imported batteries are as follows:—

	Class A From the United States	*Class B* From Canada	*Class C* From Hong Kong	*Class D* From other countries
1. Bijou or No. 216	7d.	5d.	3½d.	4½d.
2. Large unit cell, large mono or No. 2	5d.	4½d.	3½d.	4d.
3. Medium or baby, small mono or No. 1 "Unicel" ..	5d.	4d.	2½d.	3d.
4. Fountain pen or "Penlite" single cell or No.9 "Unicel"	4d.	3d.	—	—
5. Fountain pen or "Penlite" 2 cell	8d.	6d.	—	—

These prices do not include Purchase Tax; the permissible addition where tax has been paid is ½d. on a battery costing 2½d.; ¾d. on a battery costing 3d. or 3½d.; 1d. on a battery costing 4d. or 4½d.; 1¼d. on a battery costing 5d. or 6d.; 1½d. on a battery costing 7d.; and 2d. on a battery costing 8d.

Engineering Tables

By a careful selection of technical data, coupled with an adequate index, Babcock & Wilcox, Ltd., have produced, in the latest edition of "Useful Tables," a pocket book which is really what its name implies. Within the compass of 155 pages, measuring about 4¼ by 2⅞ by ¼ in. (thick), is contained essential information that most engineers need for quick reference. In addition to the usual particulars of the physical properties of metals and gases, measurements and conversion factors of various kinds, there is included such electrical matter as the current, starting torque, power factor and efficiency of motors. The concise compound interest tables give will also be of use to many.

As might be expected from the main activity of B. & W., the data relating to combustion seems to be as complete as the limitations of space permit. They include the latest steam tables (in both British and metric systems) with values within the agreed international tolerances and extending up to critical temperature and pressure. Other typical information relates to coal and fuel-oil characteristics, draught calculations and curves showing the relation between excess air and CO_2. The appearance of this pocket book marks the close approach of the fiftieth anniversary of the incorporation of the company.

Fatality

An inquest was held recently at Southampton into the death of George A. Coffin, a linesman employed by the West Hampshire Electricity Company. Coffin and another man were repairing an overhead line when the deceased man removed the earthing chain. Both men received a shock; Coffin was killed and his companion was thrown to the ground and seriously injured.

Mr. G. T. Garwood, the company's engineer and resident manager, giving evidence, described the precautions which were ordinarily taken to secure the safety of men working on overhead lines. The main supply between Hythe and Fawley had failed and when he visited the Totton substation he found that the line had not been isolated. Coffin had apparently removed the safety earthing wire prematurely and had thus received a fatal shock.

Mr. G. H. Perkins, distribution engineer, said that the main supply was off when he arranged for the repairs. There were no services at work on the line when he visited the Totton substation and therefore there was no necessity to isolate the switches. He had no reason to doubt that the usual precautions would be taken. Upon the restoration of the main supply he was alarmed to find that the Fawley line was switched on. Another witness said that Coffin should have descended the pole before disconnecting the earthing chain.

A verdict of "Accidental death" was returned.

Dissolution of Partnership

The partnership of William Mackenzie & Co., electrical contractors, MacLaren Place, Netherlee, Glasgow, has been dissolved by the retirement of Mr. W. J. R. Mackenzie. The remaining partner, Mr. P. N. Paterson, will continue to carry on the business under the name of "MacLaren Place."

Change of Name

Eastern Tools & Gauges, Ltd., 4, Walbrook, E.C.4, has changed its name to Assemblies, Ltd.

Changes of Address

Delco-Remy & Hyatt, Ltd., have moved their administrative, accounting, general sales and supply departments to Church Street, Dunstable, Beds. (Telephone, Dunstable 690; Telegrams, Delremhyat, Dunstable). The company's electric motor sales, repairs and service departments are continuing to operate from 111, Grosvenor Road, London, S.W.1.

Charles White, Ltd., have moved to 12, Bread Street Hill, E.C.4.

Calendars

A charming picture of a young man in overalls, entitled "Ready for Anything," forms the tasteful calendar received from G. E. Wallis & Sons, Ltd.

Milne & Longbottom have sent us their calendar for 1941 which has an excellent picture, with a silk finish, of the choir of Canterbury Cathedral.

A calendar in the shape of a lamp received from the Insular Electric Lamp Works, Ltd., has daily sheets with mottoes.

Instead of their usual calendar, Landis & Gyr, Ltd., have sent us a set of memorandum slips.

Fernand Espir, Ltd., have sent us a refill for their desk calendar.

TRADE MARK APPLICATIONS

AMONG recent applications for British trade marks are the following, objections against which may be entered within one month from December 26th:—

MUREX. No. 612,317. Class 9 (IV). Electric welding electrodes and electric welding apparatus. Murex Welding Processes, Ltd., Hereford Road, Walton Cross, Herts.

SUPERTHENE. No. 613,046. Class 9 (IV). Electric insulated cables and wires; and No. 613,047. Class 17 (IV). Electric insulators and electric insulating material. W. T. Henley's Telegraph Works Co., Ltd., Milton Court, Westcott, Dorking.

RAW MATERIALS

A Review of the Metal and Rubber Markets

FOLLOWING our usual practice we are publishing below an annual review of the most important raw materials employed in the electrical industry, namely copper, lead, spelter, aluminium, tin and rubber. As might be expected, conditions have changed radically since 1939 and both the requirements and the effects of the war have affected to varying extents not only the availability of the different materials but also their prices and sources. We are indebted to the Metal Information Bureau, Ltd. for the information.

Copper

As is perhaps hardly surprising, 1940 has proved a most eventful year for the copper market. So far as this country is concerned, supplies have continued to be drawn almost entirely from the Empire, where producers have been straining every effort to turn out the largest possible quantity of metal. The very big war demand has kept copper and brass manufacturers here working to capacity practically throughout the year, and indeed, in certain sections of the fabricating industry, the full capacity has proved barely sufficient to meet the voracious demands of the finishing plants, so that some substantial quantities of copper and brass semi-finished materials have been bought in the United States.

Adequate supplies of raw copper have been provided by Empire producers, some moderate purchases of electro in the United States at one time during the year being made with a view to building up a little reserve stock here. An interesting development is the new plants which are being erected in Canada and other parts of the Empire for the fabricating of copper and brass, especially as these are likely to remain in existence after the war.

During 1940 the needs of the Services, the closing of some sources of supply and the expansion of others have all combined to bring about a considerable change in the conditions of the markets for the various materials employed in the electrical industry

The German invasion of Norway, Belgium, Holland and France, and Italy's entry into the war on the side of the Axis, have all had important effects on the copper market. By their invasion of Norway the Germans acquired some copper ore supplies, although not as much as they would have liked, and their invasion of Belgium did little to improve their position, as the Belgian refineries work on Congo copper, which is now at the disposal of Britain and her Allies. With the collapse of France big contracts fell through for South American copper, and also for semi-finished products from United States manufacturers. For a time this caused a rather depressed tone in what remained of the open copper market, owing to the difficulty experienced by Chilean producers in disposing of their output, and production there was severely curtailed for a time.

In the United States the position was only moderately satisfactory in the early months of the year, but as that country's armament programme began to get under way, and her increasing assistance to Britain became effective, consumption of copper there rose very sharply in the second half of the year, and although so far domestic production has met home requirements, it is anticipated that in the coming year the United States will need to import South American copper in substantial quantities.

Japan has been quite a big buyer for most of the year, but in the later months found some reluctance on the part of American producers (both North and South America) to sell large quantities. American stocks fell pretty sharply in the later months of 1940 following some unprecedented buying activity, which included sales of no less than 255,000 short tons during the month of September. Apart from shell bands, cartridge and shell cases, modern warfare makes enormous demands on copper owing to the widespread use of electrical equipment in modern mechanised armies, to say nothing of the very big air fleets employed.

It is virtually certain, therefore, that although Central Europe is having to economise most rigidly in the consumption of copper by utilising substitutes wherever possible, 1941, at any rate as long as the war continues, will see a pretty ready outlet for all available supplies of copper. Japan may find it increasingly difficult to cover her needs, and some big Russian inquiries recently have also been difficult to satisfy. America seems to be following the British lead in keeping prices under very rigid control, although so far this has been done by an expression of Government wishes rather than actual legislation. In the United Kingdom the price was controlled throughout the year at £62 delivered.

Lead

While the strategic importance of lead remains very high, it has been perhaps in easier supply in this country than any of the other major non-ferrous metals. This is due to the fact that there is a large Empire production which has been taken over by the Ministry of Supply, and whilst consumption for cables and batteries in particular, and in certain miscellaneous uses has broadened considerably owing to Government requirements, the virtual stoppage of activity in the private house-building industry has released very large tonnages of lead for more essential purposes. As a result it has been possible not only to provide all the necessary supplies for the war effort, but to make fairly generous allocations for home industrial purposes after providing full supplies for any export requirements which may have arisen.

The over-running of the Continental countries by Germany cut off nearly all the outlet for Mexican lead, and for a time producers there were faced with a very difficult situation, as production cannot readily be curtailed owing to the regulations imposed by the Mexican Government. Later in the year, however, some large tonnages were shipped to the United States at low prices, and a good deal of this was eventually imported and used for domestic purposes, after paying the duty of 2½ cents per lb.

The American domestic position grew gradually tighter as the year progressed, consumption broadening appreciably as the American armament programme got under way, and stocks of refined metal fell to only about a month's supply, the lowest figure for a considerable time. It was this that made it possible for Mexican lead to be imported, as in the ordinary way the domestic price is so adjusted as to prevent importations of foreign metal. In the U.K. the price was controlled throughout the year at £25 delivered for soft foreign pig (duty paid).

Spelter

There has been a growing stringency in the supply position of spelter, not only so far as this country is concerned, but also in the United States, during 1940, and suggestions made prior to the war that spelter had become of less importance as a strategic metal since the 1914-18 struggle have been completely falsified by events. The German invasion of Norway, Belgium and Holland imposed a considerable strain on Allied spelter supplies owing to the fact that France's sources of supply were seriously curtailed, and although the collapse of France to that extent lessened the strain on the Ministry of Supply, the very high rate of consumption has nevertheless caused spelter to be reserved almost entirely for essential purposes, with only very limited quantities allocated for industrial or even for export requirements.

High-grade metal has been in most insistent demand owing to the fact that the brass mills here have been working at top capacity throughout the year, and in addition a much increased use of zinc base alloy die castings has developed in the aircraft industry, partly as a substitute for aluminium. Ordinary grades of spelter for galvanising have not been quite as tight, but since the Empire production is mostly high-grade metal from which g.o.b. is obtained by degrading, supplies of g.o.b. have been kept down.

In America a very tight position has developed, as although adequate supplies of zinc concentrates are obtainable from sources which previously shipped them to the Continent for treatment, smelter capacity is limited, and American consump-

tion has increased very rapidly, partly as a result of British orders for brass products, and partly owing to America's own armament programme. At the present time, therefore, countries like Japan and Russia, which occasionally need to import zinc are finding it very difficult to obtain the material at any price. Germany has now control of an enormous smelter capacity, but has not added materially to her ore supplies by her Continental conquests. In the U.K. the price was controlled throughout the year at £25 15s. delivered for g.o.b., foreign (duty paid).

Aluminium

The enormous increase in the consumption of aluminium and light alloys in aircraft has put a strain on Empire productive capacity, and although the latter is being increased, aircraft production is also rising, and the stringency in virgin aluminium supplies seems likely to continue. Aircraft requirements have received priority in the matter of aluminium supplies, and this metal is now barred from use for a number of ordinary industrial purposes, and even the electrical industry has had to curtail its consumption quite considerably.

During the year official recognition has been given to the importance of the utilisation of scrap aluminium and light alloys, and big strides have been made in this direction with benefit to the general supply position. The increasing quantities of American aircraft being supplied to this country are being catered for by a rapidly rising American aluminium production, and there is now not the slightest doubt that aluminium ranks as one of the major non-ferrous metals. Germany, of course, is using aluminium wherever possible in place of copper and other metals which she is less favourably placed to produce. Prices here have remained controlled at £110 a ton delivered for ingots, it being significant that the Control is now in the hands of the Minister for Aircraft Production. In America it is worthy of comment that prices have actually been reduced twice during the year, thanks to the rapidly expanding production.

Tin

The outstanding feature in tin has been the determination in the United States to acquire big reserve stocks. This was first manifested by private interests who built up sizeable reserves, and later by a Government arrangement with the International Tin Committee whereby a Government sponsored company in America, the Metals Reserve Co., agreed to buy up to 75,000 tons of tin at a fixed price of 50 cents per lb. c.i.f. between July 1st, 1940, and June 30th, 1941. The International Tin Committee agreed to increase quotas to 130 per cent. for twelve months to provide the necessary tin. In addition the United States has arranged to erect a Government owned tin smelter, and has contracted for up to 18,000 tons of tin in the form of ore from Bolivia for a period of five years.

With the German seizure of Holland the Arnhem smelter became inoperative, and Dutch East Indies ores were diverted to the Straits Settlements for treatment. United Kingdom consumption has been running at record levels, but at the present time world production is much in excess of consumption as Central Europe is largely cut off from tin supplies. However, there is a ready outlet for the balance in the American war reserve, and prices for the time being seem more or less stabilised.

Rubber

Although prices of raw rubber fluctuated only moderately during 1940, they were maintained at a higher level than in any year since the Regulation Scheme came into force in 1934. As with tin the United States decided to accumulate big stocks of rubber as a war reserve, and production quotas, after being 80 per cent. for the first half of the year were 85 per cent. for the third quarter, 90 per cent. in the last quarter, and have been fixed at 100 per cent. for the first quarter of 1941. There has been a big demand for rubber, of course, for essential uses in this country, both for tyres for Service vehicles and for electrical insulation purposes, many of which are, of course, direct war work.

It was on July 1st that the Colonial Office announced the agreement between the U.S. Government and the International Rubber Regulation Committee for the purchase by the former of 100,000 to 150,000 tons for shipment before the end of the year, and in August it was announced that the U.S. Government would buy an additional 180,000 tons for shipment in 1941. Reserve stocks were also accumulated in the United Kingdom. Although Central Europe has been largely cut off from rubber supplies, shipments from producing countries for the first ten months of the year were greater than in any whole year of the previous decade.

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Women in the Supply Industry

I WAS interested in the leading article in your issue of December 13th, and in case it is of interest to you I would mention that my Council engaged the services of a female meter reader some five months ago. It was more in the nature of an experiment, and I can testify that the results have exceeded even my expectations.

A small weekly wage (actually 30s.) is given, plus one penny bonus for every meter read and the average weekly earnings are £3. The successful candidate was a married woman, and the hours were arranged to give her time to look after her home and children (her husband is in the Army) and her service is entirely satisfactory. Should you require any further details I will be only too pleased to furnish them.

Morley (Yorks.), *Dec. 16th.* N. HUNTER,
Engineer & Manager.

Engineers as Administrators

You refer in your issue of December 6th, to some recent addresses in which eminent engineers raised the question of the absence of engineers as administrators. Some years ago this phenomenon occasioned here and there an indignant challenge. More recently, no doubt because of the happenings of the time, the challenge is assuming the proportions of a chorus. The American Institute *Journal* has inspiring articles in nearly every issue on the subject, or on the analogous question of the engineer and his community obligations.

It appears that engineers are awaking to the fact that the "art of directing the great sources of power in nature for the use and convenience of man" calls far more from them than being merely obedient *advisors*. Engineering schools should examine their courses with a view to determining if they are meeting the demand of the times and producing the required personnel for research, production, construction and maintenance, and administration. The approach to professional engineering is now largely through colleges as distinct from the pupilage method of the past. The latter however afforded men human and business contacts not provided in colleges and meant a great deal in the development of inherent administrative capacity.

There are many who claim that the question of the engineer in administration and other important issues would be advanced if engineers were required to be registered by law as is the case in the majority of the United States.

I would commend to those interested a "Report on the scientific and professional staffs in the public services and industry" published by the British Science Guild in 1931—time has not weakened its appeal.

I remember seeing in the ELECTRICAL REVIEW letters relevant to this subject from the Engineers' Association (Dublin) and as it may interest you I enclose copy of the *Engineers' Journal.* You will see from the Association's objects and the contributions that in Ireland engineers are concerned with improving public relations and with the place they should occupy in administration.

Dublin, *Dec. 14th.* R. A. H. JACKSON.

The *Engineers' Journal* sent us by Mr. Jackson sets forth the objects of the Cumann na nInnealtori (Engineers' Association). The first is "To further the interests of the engineering profession and assist it to fulfil its obligations to the public by considering the sociological, economic and cultural effects of engineering operations, and to advance the economic, social and other interests of the engineer." Other objects are "to interest itself in, and encourage engineers to take interest in, social and economic matters and to participate, and promote the participation of engineers, in public service activities"; and to secure that the administrative ability of members of the engineering profession is given full recognition.—EDS. ELEC. REV.

ELECTRICITY SUPPLY

Shelter Lighting and Heating. London J.E.A.'s Improved Finances

Aylesbury.—REDUCING PEAK LOAD.—The chairman of the Electricity Committee has appealed to consumers to restrict the use of electricity as much as possible between the hours of 7.30 and 9 a.m., when the peak occurs. He points out that a reduction of consumption during this period could make a difference of several thousand pounds in the grid charges which the Department has to pay.

Bedford.—LOAN SANCTIONED.—The Town Council has received sanction to borrow £16,165 for a substation, mains, etc.

Billingham-on-Tees.—SHELTER INSTALLATIONS.—The Urban District Council is considering installing heating and lighting in shelters and the clerk has been asked to approach the North-Eastern Electric Supply Co., Ltd., regarding charges.

Bolton.—STREET LIGHTING.—The Corporation Lighting Department has practically completed the installation of modified street lighting. All main roads are now lighted by this method with one small exception, and Bolton now has over 1,300 "starlight" lamps—835 electric and 500 gas.

Brierfield.—TARIFF DECISIONS.—The Urban District Council has decided to reduce the discount allowed to electricity consumers from 5 to 2½ per cent. It is also discontinuing the hire charge of 5 per cent. and increasing the interest from 2½ per cent. to 5 per cent. per annum.

APPARATUS FOR HIRE-PURCHASE.—Application is being made for sanction to borrow £4,000 for consumers' appliances on hire-purchase.

Canterbury.—ALTERNATIVE SUPPLY.—The City Council is to seek the approval of the Electricity Commissioners for an alternative electricity supply.

Dundee.—LIGHTING OF DOMESTIC SHELTERS.—The Electricity Committee has agreed to dispense with the provision of separate meters in domestic shelters. This will permit the installation work to be carried out both more cheaply and more quickly.

Chester.—LOAN SANCTION.—The Electricity Committee has obtained sanction to borrow £5,892 for mains and substations and £1,625 for spare transformers for A.R.P. purposes.

Edmonton.—SHELTER LIGHTING.—Preparations are being made for installing electric lighting in public air-raid shelters.

Eire.—PROSPECTS OF LINK WITH NORTHERN IRELAND.—Speaking during the debate on the Eire Government's Electricity Supply Amendment Bill recently, Mr. McEntee, Minister for Industry and Commerce, said that preparations should be made at once to develop the Erne scheme but it would be rather long drawn out. Questioned with regard to the proposed linking-up with the Belfast Corporation's Harbour power station, Mr. McEntee said that this had been considered but they had not been able to make much progress.

Fareham.—LOAN.—The Council has received sanction to borrow £5,986 and to apply up to £1,000 from the 1940-41 surplus to meet expenses chargeable to capital in connection with the purchase of electricity meters.

Hexham (Northumberland).—STREET LIGHTING DECISION.—The Urban District Council has rejected a recommendation by the Finance Committee to terminate the street lighting agreement with the North-Eastern Electric Supply Co., Ltd. A deputation from the Council has discussed the matter with the Supply Co., and at a special meeting of the Council it was reported that the company had a "cast-iron" case to make a charge for street lighting even if no energy was being supplied. The £450 asked for by the company was based on legitimate charges.

Llandrindod.—ELECTRICITY TO BE CHEAPER?—A considerable increase in the output of the power station (for the four weeks ended November 24th it was 106,650 kWh, as compared with 72,530 kWh in the corresponding period of 1939) is expected to result in a decrease in charges for electricity.

London.—J.E.A.'s FINANCES.—At yesterday's meeting of the London and Home Counties Joint Electricity Authority the Finance Committee presented a statement showing that the surplus for the year just ended was £700, against an estimate of £6,350. To this are added £10,000, the increase in the "lag" due to continuous meter reading and £12,000 received on account of the Kingston bulk supply agreement raising the total estimated surplus to £22,700, which reduces the accumulated deficit to £61,397 at December 31st, 1940. The Committee's estimates for 1941 show an anticipated surplus of £800 but the possible effect of "unpredictable factors" is mentioned.

The capital expenditure for 1941 is put at £121,300, plus any amounts involved in the provision of alternative means for bulk supply. Of the total £30,000 is for mains and services, £10,000 for substations and equipment, £10,000 for meters, £1,000 for house wiring installations, £10,000 for consumers' electrical apparatus, £200 for substation sites, £100 for instruments and £60,000 special expenditure on reinforcement of mains and fire protection.

ST. MARYLEBONE.—The Borough Council Electricity Committee is to effect temporary revisions of long-term agreements for the supply of electricity when thought advisable owing to war conditions.

Lytham St. Annes.—HIGHER CHARGES PROPOSED.—The Corporation General Purposes Committee recommends an increase of 10 per cent. in the electricity charges. No increase has been made in tariffs so far since the war began.

Morecambe.—NEW SUBSTATION.—The Corporation Electricity Committee is to provide a new substation costing £3,650.

SHELTER HEATING.—The borough electrical engineer has been authorised to install electric lighting in eighty-one shelters at a cost of £1,172.

Paisley.—A.R.P. FITTINGS.—Mr. Daniel Ross, engineer and manager of the Paisley Corporation Electricity Department, informs us that 2,250 A.R.P. fittings have now been erected in the burgh of Paisley. This completes the scheme.

Plymouth.—POWER STATION PLANT.—The Electricity Committee is to invite selected firms to quote for the supply of circulating water pipes, auxiliary switchgear, motors and starters, and steam and feed pipes for the power station.

Southend.—SUPPLY TO EVACUATED PREMISES.—Some difficulties have been experienced by the Electricity Department in connection with the accounts of consumers who have left the town. The engineer recently informed the Council that a number of "evacuees" had asked that their premises should not be disconnected. The Electricity Committee therefore proposes that as from the date of the declaration of the town to be an evacuation area or from the time at which premises were vacated, consumers on the all-in domestic tariff shall be charged a minimum of 5s. per quarter, plus meter rent, for the evacuation period instead of the ordinary charges. Consumers on the contract lighting rate will be allowed to transfer to the "B" rate (5d. per kWh consumed plus 15 per cent.) with a minimum of 5s. per quarter, plus meter rent.

Stoke-on-Trent.—SWITCHGEAR FOR FACTORIES.—Switchgear and equipment is to be provided in connection with factory extensions at a cost of £750.

SUPPLY ARRANGEMENTS.—The Electricity Committee has arranged terms with the Stone Urban District Council for an additional supply to Hanford, at a cost of £1,750. Sanction has been obtained to erect overhead lines for supplying the Meir housing estate. The Housing Committee is to obtain fresh tenders for wiring 115 houses on the Meir estate.

SHELTER HEATING.—The Corporation Emergency Committee is to install tubular electric heating at shelters at Penkhull Homes at a cost of £50 and has instructed the co-ordinating officer to experiment with the heating of shelters by means of electric heating cable. The Electricity Committee is to provide supply at a cost of £700 in connection with the installation of heating and air-conditioning plant at the Tinkersclough shelter.

STAND-BY PUMP.—The Corporation Sewage Committee is to install a stand-by electric pump at the Bucknall works.

FACTORY SUPPLY.—The Corporation Electricity Committee is to provide supply at a cost of £200 to the works of Jackson Bros. (Milton), Ltd.

Wednesbury.—SHELTER INSTALLATIONS.—The Education Committee is to have a system of lighting and heating installed in school shelter trenches at a cost of £1,725.

York.—SUPPLY TO STORAGE PREMISES.—The Electricity Committee is seeking sanction to borrow £1,950 for cables, transformer and switchgear for a food storage warehouse.

TRANSPORT

Belfast.—OVERHEAD EQUIPMENT FOR TROLLEY BUSES.—The Town Council has approved the expenditure of £750 on overhead equipment for trolley buses.

Sunderland.—REVISION OF FARES.—The Ministry of Transport has approved the Corporation's plan to replace the 2d. universal fare with a 1½d. (any distance) ticket on trams and buses and the change came into operation on January 1st. Mr. C. A. Hopkins, transport manager, commenting on the change, said the 2d. ticket was open to abuse and the new charge would help to improve things.

RADIO AND TELEPHONY

Exeter.—RADIO FOR POLICE.—The Watch Committee has prepared a scheme for police wireless at a cost of £1,750.

Middlesbrough.—POLICE WIRELESS.—The Watch Committee has decided to provide two fixed and two mobile wireless stations for police use.

Southend-on-Sea.—POLICE RADIO.—The local police are to be equipped with radio apparatus at a cost of £1,800.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1938

16610. "Electric discharge lamps." F. J. G. Van Den Bosch. May 31st, 1939. (529972.)

1939

6698. "Control of electric current by means of discharge apparatus." Westinghouse Electric International Co. March 5th, 1938. (Cognate application 6699/39.) (530238.)

7280. "Oscillating electric regulators." Allmänna Svenska Elektriska Aktiebolaget. March 7th, 1938. (530239.)

9825. "Electric control systems." British Thomson-Houston Co., Ltd. March 29th, 1938. (529973.)

10180. "Electric valve circuits." British Thomson-Houston Co., Ltd. March 31st, 1939. (Convention date not granted.) (530105.)

10390. "Electric gas-blast switches." British Thomson-Houston Co., Ltd. April 2nd, 1938. (530241.)

12642. "Frequency-controlling systems." British Thomson-Houston Co., Ltd. April 28th, 1938. (530107.)

12821. "High-frequency oscillation generators." Marconi's Wireless Telegraph Co., Ltd. April 29th, 1938. (Cognate application 12822/39.) (530109.)

15323. "Electric torches." W. R. Sharp. May 23rd, 1939. (530249.)

15804. "Electric lampholders and like electrical connections." Ward & Goldstone, Ltd., and S. Goldstone. May 30th, 1939. (529978.)

15821. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd. May 28th, 1938. (530046.)

15883. "Loop equipped radio receivers." A. A. Thornton. (Philco Radio and Television Corporation.) May 30th, 1939. (529980.)

15912. "Electric illuminating circuits." British Thomson-Houston Co., Ltd. May 28th, 1938. (530047.)

15916. "Electric communication cables." Standard Telephones & Cables, Ltd., D. Nunn and A. W. Gent. May 30th, 1939. (529981.)

15918. "Two-way electric communication systems." Standard Telephones & Cables, Ltd., and G. O. Probert. May 30th, 1939. (529982.)

15921. "Radio transmission systems employing pulse modulation." Kolster-Brandes, Ltd., and W. A. Beatty. May 30th, 1939. (529984.)

16000. "Remote control systems." Westinghouse Brake & Signal Co., Ltd. July 19th, 1938. (529990.)

16052. "Electric discharge devices." British Thomson-Houston Co., Ltd. June 1st, 1938. (530251.)

16090. "Electrical networks." Marconi's Wireless Telegraph Co., Ltd. May 31st, 1938. (529999.)

16281. "Electric remote control and/or supervisory systems." Standard Telephones & Cables, Ltd., E. M. S. McWhirter and H. J. Ward. June 2nd, 1939. (530051.)

16284. "Electron-discharge devices and envelopes therefor." Standard Telephones & Cables, Ltd., W. A. Windsor and R. B. Davis. June 2nd, 1939. (530052.)

16285. "Manufacture of electric cables." Standard Telephones & Cables, Ltd., W. K. Weston and W. J. L. Wildbore. June 2nd, 1939. (530053.)

16313. "Systems for eliminating static interference in radio-receiving systems." W. E. Zuccarello. November 15th, 1938. (530256.)

16314. "Telephone instrument circuits." Associated Electric Laboratories, Inc. July 22nd, 1938. (530257.)

16372. "Wireless aerials." Bullers, Ltd., and J. E. Nickless. June 3rd, 1939. (530114.)

16373. "Frequency changing circuits." Kolster-Brandes, Ltd., D. S. B. Shannon and P. K. Chatterjea. June 3rd, 1939. (530115.)

16379. "Electric generators for use in mines." Friemann & Wolf Ges. June 3rd, 1938. (530118.)

16549. "Deflecting circuits for cathode-ray tubes." A. R. Grenfell. June 6th, 1939. (530259.)

16556. "Electron multipliers." Baird Television, Ltd., and G. E. G. Graham. June 6th, 1939. (530260.)

16601. "Electric distribution pillars." W. T. Henley's Telegraph Works Co., Ltd., and E. Moor. June 6th, 1939. (530262.)

16603. "Focusing and deflecting means for cathode-ray tubes." Standard Telephones & Cables, Ltd., and C. N. Smyth. June 6th, 1939. (530263.)

16617. "Duplication of sound recording tapes." K. Daniel. June 14th, 1938. (530265.)

16622. "Variable capacitance electrical condensers." A. H. Hunt, Ltd., and F. L. G. Bettridge. June 6th, 1939. (530266.)

16815. "Plastic moulding compositions." British Thomson-Houston Co., Ltd. June 8th, 1938. (530007.)

17062. "Control systems for dynamo-electric machines." British Thomson-Houston Co., Ltd. June 10th, 1938. (530122.)

17147. "Plug-and-socket coupling device." General Electric Co., Ltd., and R. E. Gilbert. June 12th, 1939. (529926.)

17153. "Turbo-electric drive for vehicles and method of controlling a vehicle." E. G. Budd Manufacturing Co. June 16th, 1938. (529929.)

17167. "Electric connector plugs." British Thomson-Houston Co., Ltd. June 10th, 1938. (529933.)

17168. "Electric discharge devices." British Thomson-Houston Co., Ltd. June 11th, 1938. (529934.)

17218. "Electric water heating devices." A. Aalbregt and F. W. Muncaster. June 13th, 1939. (530060.)

17288. "System of coupling transmission circuits." Standard Telephones & Cables, Ltd. July 1st, 1938. (529956.)

17298. "Dry rectifiers." British Thomson-Houston Co., Ltd. June 14th, 1938. (529957.)

17329. "System for controlling the reactance of an electric circuit by means of an electric discharge tube coupled thereto." Philips Lamps, Ltd. June 13th, 1939. (529964.)

17348. "Electric switches of the tumbler or rotary type." J. A. Crabtree & Co., Ltd., H. F. McLoughlin, B. G. Harrison and R. W. Morgan. June 14th, 1939. (Cognate application 9529/40.) (529966.)

17349. "Electric switches of the tumbler type." J. A. Crabtree & Co., Ltd., H. F. McLoughlin and B. G. Harrison. June 14th, 1939. (530124.)

17364. "Contacts suitable for electric distribution pillars and other apparatus." W. T. Henley's Telegraph Works Co., Ltd., and E. Moor. June 14th, 1939. (529968.)

17400. "Thermally operated switches and the like." J. E. Sherlock and British Thermostat Co., Ltd. June 14th, 1939. (530018.)

17401. "Successive switching arrangement." Houdry Process Corporation. July 12th, 1938. (530019.)

17409. "Fluorescent materials." British Thomson-Houston Co., Ltd. June 17th, 1938. (530021.)

17410. "Elastic fluid turbines." British Thomson-Houston Co., Ltd. June 17th, 1938. (530022.)

17412. "Electrical terminals." British Thomson-Houston Co., Ltd., and W. L. Wise. June 14th, 1939. (530125.)

17417. "Radio and like transmitters." Telefunken Ges. für Drahtlose Telegraphie. June 14th, 1938. (530024.)

17437. "Small electric motors." Electrolux, Ltd. (Aktiebolaget Electrolux). June 14th, 1939. (530030.)

17443. "Control systems for electron microscopes." Fides Ges. für die Verwaltung und Verwertung von Gewerblichen Schutzrechten. June 14th, 1938. (530032.)

17477. "Insulated high-tension electric wires or cables." J. Drennan. June 15th, 1939. (530063.)

17481. "Production of luminescent surfaces." Soc. Belge de Recherches et d'Etudes Soc. Anon., and E. Feigl. June 15th, 1939. (530065.)

17504. "Sound reproducing apparatus." O. K. Kolb and R. A. Tomes. June 15th, 1939. (530068.)

17515. "Electrical wave filters." Belling & Lee, Ltd., and F. R. W. Strafford. June 15th, 1939. (530071.)

17517. "High-tension electric gas-blast circuit-breakers." British Thomson-Houston Co., Ltd. June 15th, 1938. (530072.)

17520. "Electric discharge devices." British Thomson-Houston Co., Ltd. June 17th, 1938. (530073.)

17521. "Tool for locking split cotter pins." British Thomson-Houston Co., Ltd., and I. H. Child. June 15th, 1939. (530074.)

17616. "Automatic telephone systems." Electrical Research Products, Inc. June 17th, 1938. (530085.)

17617. "Automatic telephone systems." Electrical Research Products, Inc. June 17th, 1938. (530086.)

17619. "Automatic telephone systems." Electrical Research Products, Inc. June 17th, 1938. (530087.)

17629. "Electrical switches." United-Carr Fastener Corporation. June 25th, 1938. (530090.)

17640. "Electric irons and other electrically heated utensils." G. H. Collins and H. F. Collins. June 16th, 1939. (530092.)

17655. "Construction of television receivers." Standard Telephones & Cables, Ltd., and D. S. B. Shannon. June 16th, 1939. (530095.)

17657. "Electrical devices." Standard Telephones & Cables, Ltd. August 6th, 1938. (530096.)

17660. "Lecher wire system." C. Lorentz Akt.-Ges. June 22nd, 1938. (530097.)

17663. "Electric discharge lamps and starting apparatus." British Thomson-Houston Co., Ltd. June 16th, 1938. (530098.)

(*Concluded on page* 214)

FINANCIAL SECTION

Reports and Dividends. New Companies. Capital Returns. Debenture Charges. Bankruptcies and Liquidations. Stocks and Shares

Reports and Dividends

The General Cable Manufacturing Co., Ltd.—Speaking at the annual meeting of the company, Mr. C. W. R. Pantlin (chairman) stated that the major portion of the considerable increase in profits (from £22,585 to £57,249) was due to the fact that the contracts in which the company had been engaged had necessitated running most of the plant twenty-four hours a day throughout the year. It followed that the plant had been subjected to a great strain, and their experience clearly showed that a radical alteration was required in the statutory depreciation allowance otherwise the company might find itself in a detrimental position at the end of the war.

Furthermore, he believed that the Excess Profits Tax should be amended so as to allow a small part of any additional profits of a business to be retained, if only 10 per cent., so that at the conclusion of the war managements could have funds available to deal with major problems of industry which would inevitably have to be faced. During the current year it appeared that their entire production, working on a twenty-four hour basis, was likely to be absorbed and it might well be that the turnover and profit would be still higher, but that, once again, would constitute no advantage to the company itself.

R. A. Lister & Co., Ltd., report that after providing for depreciation, taxation and contingencies, there was a net profit of £99,577 for the year ended September 30th last. This is £16,997 more than for the previous year. Ordinary dividend and bonus again absorb £66,150, while preference dividends take £11,025. A sum of £25,000 again goes to reserve, with a further £2,500 for additional pensions reserve, leaving £70,683 to be carried forward as compared with £75,961 for 1938-39, when £30,011 provision for contingencies was written back to profit and loss account.

The Buenos Aires Town & Docks Tramways Co., Ltd., reports that for the year ended June 30th interest on investments totalled £4,898 (as against £4,353), sundries £19 (£473), difference on exchange £2,230 (nil), making £7,147 (£15,850, including £11,024 working profit for the period July 1st, 1938, to February 16th, 1939). Expenses, fees and taxes take £6,183 (£9,220), leaving £965 (£6,630), plus £1,193 brought in, making £2,158 to be carried forward. Although the company's tram and bus services continued to be operated by the Buenos Aires Transport Corporation, the transfer of the undertaking has not yet been legally completed.

Strand Electric Holdings, Ltd., reports a profit of £1,730 up to July 11th last, compared with £1,327 for the preceding year. From this is deducted tax from dividend received (after income tax refund of £271) amounting to £648 (£348), leaving £1,081 (£979). A dividend of 2 per cent. (4 per cent.) is to be paid, leaving £87 (£328) to be carried forward.

Marconi's Wireless Telegraph Co., Ltd., is to pay a final dividend of 3½ per cent. on its 7 per cent. cumulative participating preference shares.

The British Vacuum Cleaner and Engineering Co., Ltd., announces that it is postponing consideration of the preference dividend pending the completion of the accounts.

The Montreal Light, Heat & Power Consolidated is to pay a quarterly interim dividend of 38 cents (same).

George Kent, Ltd., are to maintain their interim dividend at 3 per cent.

New Companies Registered

Austin Mills, Ltd.—Private company. Registered December 13th. Capital £1,000. Objects: to carry on the business of manufacturers and repairers of, and dealers in, radio sets and equipment, transformers, convertors, dynamos, motors, batteries, etc. Directors: S. A. A. Mills and Mrs. F. M. Mills, both of 3, St. Albans Avenue, Heaton Chapel, Stockport. Registered office: 3, St. Albans Avenue, Heaton Chapel, Stockport.

Monarch Electric, Ltd.—Private company. Registered December 16th. Capital £2,000. Objects: to carry on the business of manufacturers of and dealers in electrical household utensils, pumps, etc. Subscribers: F. S. Harrison, 249, Ulverley Green Road, Olton, Warwick, and J. N. Hant, 849, Walsall Road, Great Barr, Birmingham.

Tube Rolling Mills, Ltd.—Private company. Registered December 16th. Capital £10,000. Objects: to carry on, either

(*Continued on page* 215)

New Patents (*Continued from page 213*)

17664. "Freezing trays for refrigerators." British Thomson-Houston Co., Ltd. June 18th, 1938. (530099.)

17750. "Cathode ray tubes." Marconi's Wireless Telegraph Co., Ltd. June 21st, 1938. (530138.)

17763. "Cathode ray tubes." J. M. Dodds and Metropolitan-Vickers Electrical Co., Ltd. June 17th, 1939. (530140.)

17784. "Signs or display devices." C. E. Every. (Biolite, Inc.). June 17th, 1939. (530145.)

17881. "Water tube boilers." La Mont Steam Generator, Ltd. June 18th, 1938. (530170.)

17928. "Electric discharge devices." Westinghouse Electric International Co. June 24th, 1938. (530176.)

17929. "Arc welding systems." Westinghouse Electric International Co. June 24th, 1938. (530177.)

17933. "Ventilating systems." Carrier Engineering Co., Ltd., and C. L. Sainty. June 29th, 1939. (530178.)

17956. "Means for indirectly forced-commutation of static current convertors." Allmänna Svenska Elektriska Aktiebolaget. June 20th, 1938. (530181.)

17983. "Windings for electrical machines." British Thomson-Houston Co., Ltd. June 20th, 1938. (530190.)

17984. "Polyphase rectifier systems." British Thomson-Houston Co., Ltd. (Shibaura Engineering Works, Ltd.). June 20th, 1939. (530273.)

17989. "Method of and apparatus for the production by pressure moulding of glass bodies provided with current leads." Egyesult Izzolampa es Villamossagi Reszvenytarsasag. June 20th, 1938. (530275.)

17990. "Device for protecting electrical apparatus from voltage surges." Allen West & Co., Ltd., and E. B. Babler. June 20th, 1939. (530276.)

18057. "Tumbler switches." Walsall Conduits, Ltd., and E. Gough. June 21st, 1939. (530290.)

18071. "Filter units for the suppression of high-frequency oscillations." J. Marr. June 21st, 1939. (530292.)

18079. "Cooling of external metal parts of electric discharge devices." M-O Valve Co., Ltd., and R. Le Rossignol. June 21st, 1939. (530296.)

18090. "Magnetic blowout devices for electric switches." Igranic Electric Co., Ltd. June 2nd, 1938. (530298.)

19043. "Contact systems for electric circuit interrupters." Westinghouse Electric International Co. June 30th, 1938. (530197.)

19044. "Protection of electric rectifier systems." Westinghouse Electric International Co. June 30th, 1938. (530198.)

19045. "Electric circuit interrupters having arc-extinguishing structures." Westinghouse Electric International Co. July 1st, 1938. (530199.)

19087. "Plug and socket couplings for electrical purposes." R. W. L. A. Ham. June 30th, 1939. (530210.)

19108. "Combinations of high-pressure metal-vapour electric discharge lamps with filaments in series with them." General Electric Co., Ltd. (Patent-Treuhand Ges. für Elektrische Gluhlampen). June 30th, 1939. (530216.)

19123. "Coating of wires or the like with liquid coating compositions." British Thomson-Houston Co., Ltd. April 6th, 1939. (530217.)

19124. "Elastic fluid turbines." British Thomson-Houston Co., Ltd. July 1st, 1938. (530218.)

19134. "Aerial systems for radio receivers." Philips Lamps, Ltd., and J. B. Kaye. June 30th, 1939. (530220.)

19148. "Method of and apparatus for electrically indicating the use of seats or other apparatus." S. R. Wilkins. June 30th, 1939. (530221.)

19177. "Installation of switches in wall-boxes." J. H. Tucker & Co., Ltd., and F. C. Fuke. July 1st, 1939. (530225.)

19208. "Television scanning systems." Hazeltine Corporation. August 10th, 1938. (530227.)

19209. "Electric converting systems." British Thomson-Houston Co., Ltd. July 1st, 1938. (530228.)

21989. "Thermionic valves and cathode structures therefor." Standard Telephones & Cables, Ltd., and R. R. N. Murphy. July 28th, 1939. (530300.)

30793. "Multi-position electric switches particularly for controlling electric motors." British Thomson-Houston Co., Ltd., and W. L. Wise. May 22nd, 1939. (Divided out of 515220.) (529766.)

1940

653/4. "Electric fuses." British Thomson-Houston Co., Ltd. May 23rd, 1938. (Divided out of 529118.) (529768/9.)

2257. "Portable electrically-driven tools." Black & Decker Manufacturing Co. March 10th, 1939. (Divided out of 529220.) (529835.)

13585. "Control of electric current by means of discharge apparatus." Westinghouse Electric International Co. March 5th, 1938. (Divided out of 530238.) (Cognate application 13586/40.) (530301.)

directly or by means of subsidiary companies, the business of manufacturers of and dealers in metal tubes, conduit tubes and other fittings for electric wiring, metal rollers, wire drawers, engineers, etc. Subscribers: H. C. Chambers, 23, Blakesley Road, Yardley, Birmingham and A. J. Corbett, 25, Oakfield Road, Selly Park, Birmingham. The first directors are A. G. Stewart, J. C. Cooper, A. R. Stedeford and H. G. Kernan. Solicitors: Pinsent & Co., Birmingham.

John Kelly & Son (Kitchen Engineers), Ltd.—Private company. Registered in Edinburgh, December 19th. Capital, £100. Objects: to carry on the business of kitchen, cooking, heating, hot water, cooling, ventilating, sanitary, electrical and constructional engineers, etc. Directors: T. S. Kelly, 113, Rose Street, Edinburgh, and two others. Registered office: 82, Gordon Street, Glasgow, C.1.

Howell Williams Wholesalers (Neath), Ltd.—Private company. Registered, December 19th. Capital, £100. Objects: To carry on the business of manufacturers of, and dealers in, wireless and television sets, accessories and apparatus, artificial lighting apparatus, electrical fittings and appliances, etc. Directors: H. Williams and Mrs. V. Williams, both of 283, Neath Road, Briton Ferry. Registered office: 25, Green Street, Neath.

Companies' Returns

Statements of Capital

Berry's Electric, Ltd.—Capital £225,000 in 10s. shares. Return dated August 5th, 1940. 282,007 shares taken up, £1,003 10s. paid. £140,000 considered as paid. Mortgages and charges: £48,200.

Crossley Bros., Ltd.—Capital £1,492,293 in 201,695 preference, 201,695 preferred ordinary shares of £1; 1,014,014 deferred ordinary shares of 5s. and 3,341,598 unclassified shares of 5s. Return dated August 5th, 1940. All preference, preferred ordinary and deferred ordinary shares taken up, £326,012 10s. paid on 139,100 preference, 139,100 preferred ordinary and 191,250 deferred ordinary shares. £330,881 considered as paid on 62,595 preference, 62,595 preferred ordinary and 822,764 deferred ordinary shares. Mortgages and charges: Nil.

Mid-Lincolnshire Electric Supply Co., Ltd.—Capital £700,000 in 700,000 shares of £1 each. Return dated August 6th, 1940. All shares taken up. £595,000 paid. £105,000 considered as paid. Mortgages and charges: Nil.

Midland Electric Installation Co., Ltd.—Capital £10,000 in £1 shares. Return dated August 15th, 1940. 6,502 shares taken up, £1,502 paid. £5,000 considered as paid. Mortgages and charges: Nil.

Ionlite, Ltd.—Capital £30,000 in £1 shares. Return dated August 25th, 1939 (filed July 25th, 1940). All shares taken up. £28,000 paid. £2,000 considered as paid. Mortgages and charges: Nil.

Bective Electrical Co., Ltd.—Capital £10,000 in 116 6 per cent. preference and 80 7 per cent. preference shares of £50, and 4,000 ordinary shares of 1s. Return dated September 3rd, 1940. 116 6 per cent. preference, 72 7 per cent. preference and 4,000 ordinary shares taken up. £9,600 paid. Mortgages and charges: £1,500.

Whitehall Electric Investments, Ltd.—Capital, £7,500,000 in £5,000,000 ordinary stock and £2,500,000 preference stock. Return dated June 18th, 1940. All stock taken up. £2,500,007 paid. £4,999,993 considered as paid. Mortgages and charges: Nil.

Campbeltown & Mid-Argyll Electric Supply Co., Ltd.—Capital, £50,000 in £1 shares. Return dated August 12th, 1940. All shares taken up. £50,000 paid. Mortgages and charges: Nil.

Wigtownshire Electricity Co., Ltd.—Capital, £175,000 in £1 shares. Return dated June 17th, 1940. 135,000 shares taken up. £135,000 paid. Mortgages and charges, nil.

Standard Telephones & Cables, Ltd.—Capital £2,000,000 in £1 shares. Return dated June 18th. All shares taken up. £906,000 paid, £1,094,000 considered as paid. Mortgages and charges: Nil.

General Electric Co. Ltd.—Capital £9,600,000 in £1,800,000 6½ per cent. preference stock, £1,800,000 7½ per cent. "B" preference stock, £4,198,372 ordinary stock and 1,801,628 ordinary shares of £1. Return dated August 1st. All stock issued and fully paid up. Mortgages and charges: Nil.

Intensalite Sign & Fixtures Co., Ltd.—Capital £1,000 in £1 shares. Return dated September 19th. All shares taken up. £1,000 paid. Mortgages and charges: Nil.

Insulators, Ltd.—Capital £15,000 in £1 shares. Return dated September 5th. All shares taken up. £5,000 paid. Mortgages and charges: £10,000.

I.T.C., Ltd.—Capital, £20,000 in £1 shares. Return dated June 17th (filed September 11th). 15,000 shares taken up. £15,000 paid. Mortgages and charges: Nil.

West African Telegraph Co., Ltd.—Capital, £400,000 in £10 shares. Return dated June 5th. 23,109 shares taken up. £231,090 paid. Mortgages and charges: Nil.

Greenwood & Batley, Ltd.—Capital, £600,000 in 140,000 preference, 354,585 ordinary and 105,415 unclassified shares of £1. Return dated July 26th. 110,660 preference and 354,585 ordinary shares taken up. £201,312 paid (£1 on 69,340 preference and 121,340 ordinary shares, 6s. on 14,660 preference and 10s. on 12,390 ordinary shares, and including £39 paid on 130 forfeited ordinary shares). £247,615 considered as paid (£1 on 26,660 preference and 220,855 ordinary shares). Mortgages and charges: £100,000.

Cable & Wireless (West Indies), Ltd.—Capital, £2,445,630 in 9,782,520 shares of 5s. each. Return dated June 4th. 800,000 shares taken up. £200,000 considered as paid. Mortgages and charges: Nil.

Sphere Investment Trust, Ltd.—Capital, £1,400,000 in 600,000 preference, 600,000 ordinary shares of £1 each, 200,000 unissued. Return dated June 7th. 600,000 preference and 600,000 ordinary shares taken up. £1 per share called up on each of 131,105 preference and 164,000 ordinary and £1 7s. (including 7s. premium) on each of 100,000 preference and £1 1s. 6d. (including 1s. 6d. premium) on each of 100,000 ordinary. £495,105 plus £42,500 premium paid. £704,895 considered as paid on 368,895 ordinary and 336,000 ordinary shares. Mortgages and charges: £600,000.

Mortgages and Charges

B.C. & H. Power Station Co., Ltd.—Particulars have been filed of £100,000 first mortgage debenture stock (ranking *pari passu* with £1,650,000 like stock secured by trust deed dated June 22nd, 1938, and £750,000 like stock secured by supplemental trust deed dated June 19th, 1939). The stock is authorised by resolutions dated June 10th, 1938, June 13th, 1939, and November 26th, 1940, and secured by trust deed dated November 26th, 1940 (supplemental to trust deeds dated June 22nd, 1938, June 19th, 1939, and September 20th, 1940) and constitutes a charge on company's freehold and leasehold properties at Little Barford; certain sums due to the company by the Central Electricity Board; and the company's undertaking and other property, including uncalled capital. The amount of the present issue is £100,000. The trustees are the Prudential Assurance Co., Ltd.

Gollings & Ayres, Ltd.—Satisfaction in full on November 23rd, of charge dated January 18th, 1938, and registered January 22nd, 1938, securing all moneys due or to become due from the company to Barclays Bank, Ltd.

Receiver Released

Hydro Thermal Power, Ltd.—A. E. Jones, 3, Frederick Place, Old Jewry, E.C., ceased to act as receiver on December 9th.

Liquidations

T. C. Gilbert & Co., Ltd.—Winding up voluntarily. Liquidator, Mr. H. L. B. Carter, New Chambers, 4 West Cliff Gardens, Folkestone.

Basinghall Electric Co., Ltd.—Particulars of claims by January 10th to Mr. N. W. Osborne, 11-12 Finsbury Square, London, E.C.2.

British Blue Spot, Ltd., Sterling Works, Dagenham.—Liquidator, Mr. J. B. Thompson, Senior Official Receiver and Liquidator, 33, Carey Street, London, W.C.2, released October 10th.

Arctic Fan & Electrical Co., Ltd., 18 Maple Street, W.1, and formerly 48, Beak Street, W.1.—Liquidator, Mr. J. B. Thompson, Senior Official Receiver and Liquidator, 33, Carey Street, London, W.C.2, released November 29th.

Ray Electric, Ltd.—Meetings January 22nd, at 185–188 High Holborn, London, W.C.1, to receive an account of the winding up by the joint liquidators, Messrs. H. Howarth and C. Latham.

Bankruptcies

H. A. Smith, electrical engineer and contractor and neon sign engineer, 76, Canterbury Street, Gillingham.—First and final dividend of 8d. in the £ payable at the Official Receiver's Office, 280a, High Street, Rochester.

H. J. Gill, electrical engineer and radio dealer, 10, High Street, Keynsham, Somersetshire.—The first meeting of creditors was held on December 19th, when the case was left in the hands of the Official Receiver as trustee. The debtor's statement of affairs disclosed ranking liabilities of £776, against assets of £116, leaving a deficiency of £660. The business was commenced about November, 1926, at which time the debtor had a capital of £100. For several years past, however, difficulties had been experienced and creditors had been pressing. The present position was ascribed to lack of capital and insufficient profits to meet overhead expenses.

Improved Radio & Electrical Co., radio dealers, Oxford House, Falcon Square, London, E.C.1., receiving order made December 6th on a creditor's petition.

J. Stubbs & J. A. P. Boulton ("John Stubbs & Co."), electrical engineers, 39 Bootham, York (separate application of John Stubbs).—Discharge suspended until November 19th, 1942.

W. H. Grange ("Talbot Electrical Co."), electrical engineer, 14 Plumstead Road, Thorpe Saint Andrew, Norfolk.—Last day for receiving proofs for dividend, January 3rd. Trustee, Mr. F. R. D. Walter, Castle Chambers, Opie Street, Norwich.

R. A. J. Tully, electrician, 32J, Viaduct Road, Brighton.—Last day for receiving proofs of dividend January 3rd. Trustee, Mr. V. R. Fletcher, 8, Old Steine, Brighton.

L. Spain, radio and electrical engineer, 376, Bearwood Road, Smethwick.—Last day for receiving proofs for dividend January 5th. Trustee, Mr. R. K. Clark, 37, Temple Street, Birmingham, 2, Official Receiver.

STOCKS AND SHARES

TUESDAY EVENING.

THE year of war, 1940, was one of chequered movements in Stock Exchange prices and of a spasmodic volume of business throughout the greater part of the period. Contrary to expectation, the tendency throughout the twelvemonth in the gilt-edged market was one of steady improvement. The price of the 3½ per cent. War Loan, which sets the standard for investment securities of all kinds, gained ten points. This affords the best criterion of the disposition of investment stocks as a whole. Speculation broke out every now and then, but so infrequently as to be scarcely a factor.

The Stock Exchange has been greatly reduced in population; the amount of business transacted during the twelvemonth probably proved insufficient to pay the aggregate office expenses. Nevertheless, as already mentioned, investment prices show a general advance. Owing to the ban placed by the Treasury upon new issues, money has been compelled to confine its attentions to war loans and to the stocks and shares of existing companies. The Government's campaign for the subscription of public money to the various forms of war borrowing has not diverted attention from other markets. In fact, the comparatively low rates of interest offered by the Government loans, combined with the high income tax, has forced many people to look further afield in order to obtain investments the dividend on which will help to raise the average yield obtainable.

The defection of France on June 17th may be said to have inflicted the year's heaviest blow upon confidence, but its effect lasted so short a time that, after the first shock had been surmounted, Stock Exchange prices resumed their former upward tendency. As the following price-lists witness, the weight of money requiring investment proved to be greater than the comparatively few sales induced by nervousness in regard to the political outlook. With the heartening news of the Near Eastern successes, British stocks and shares again went ahead, until at the end of the year they had recovered from the losses sustained at the time when France went over to the enemy.

London Electricity Supply Companies

The electricity supply companies were expected, at the beginning of 1940, to suffer severely from evacuation, from the black-out, from rising costs and other conditions brought about by the war. The London companies would be, it was thought, particularly hard hit. When the "blitz." started in September, a tremor of disquiet was perceptible amongst holders of shares in the London electricity supply companies who feared lest their properties might be severely damaged by enemy action. It will be noticed that the prices in the London group have gone back:—

Ordinary Share.	*Dec. 27th,* 1939.	*High.* 1940.	*Low.* 1940.	*Dec. 27th,* 1940.	*Fall.*
City of London ..	26s. 6d.	28s. 0d.	20s. 0d.	21s. 3d.	5s. 3d.
County of London	36s. 3d.	43s. 3d.	21s. 0d.	32s. 6d.	3s. 9d.
London Assoc. Elec.	20s. 0d.	21s. 0d.	12s. 6d.	15s. 0d.	5s. 0d.
Metropolitan ..	37s. 0d.	41s. 6d.	22s. 6d.	32s. 6d.	4s. 6d.
Northmet Power ..	37s. 0d.	42s. 3d.	22s. 6d.	31s. 3d.	5s. 9d.
South London ..	22s. 0d.	23s. 3d.	20s. 0d.	20s. 0d.	2s. 0d.

Provincial Shares Progress

It is appropriate to follow this short table with another list, showing the movements in the prices of the Provincial and Scottish companies:—

Ordinary Share.	*Dec. 27th,* 1939.	*High.* 1940.	*Low.* 1940.	*Dec. 27th,* 1940.	*Change on Year.*
Bournemouth & Poole	58s. 9d.	63s. 6d.	36s. 6d.	43s. 9d.	−15s. 0d.
Clyde Valley ..	33s. 3d.	38s. 6d.	24s. 0d.	33s. 9d.	+6d.
Elec. Dis. Yorkshire	35s. 9d.	40s. 3d.	32s. 0d.	35s. 0d.	−9d.
Lancs. Light & Power	28s. 9d.	33s. 0d.	21s. 6d.	27s. 6d.	−1s. 3d.
Midland Counties ..	35s. 0d.	39s. 0d.	23s. 3d.	32s. 6d.	−2s. 6d.
Midland Elec. Power	36s. 3d.	40s. 0d.	29s. 6d.	33s. 9d.	−2s. 6d.
North Eastern ..	27s. 6d.	31s. 6d.	16s. 6d.	25s. 0d.	−2s. 6d.
Northampton ..	42s. 6d.	44s. 0d.	38s. 0d.	40s. 0d.	−2s. 6d.
Scottish Power ..	32s. 6d.	38s. 0d.	24s. 0d.	33s. 3d.	+9d.
Yorkshire Elec. ..	33s. 9d.	40s. 0d.	23s. 6d.	33s. 9d.	—

Disabilities caused by evacuation and black-out handicaps, are to a great extent compensated for in the cases of the Provincial and Scottish companies by the fact that most of them are fully occupied with work of national consequence in the supply of current to industrial areas closely associated with war work.

Earlier nervousness with regard to a possibility of dividends being reduced has given way to a more comfortable conviction that the distributions will be maintained in most, if not all, cases. This assurance is sufficiently strong to have directed substantial sums of money into the ordinary shares, with the result that an outstanding feature of the market is scarcity of supply. The preference issues have also been, and still are in persistent demand. As for debenture stocks there is in these something approaching a famine.

Communication Stocks

The telegraph and telephone section reflects the investment demand which has been in force, with occasional spasms of uncertainty, throughout the greater part of the year. Stocks such as Anglo-American preferred, and Cable and Wireless preference, have gone ahead. Marconi Marines suffered by reason of the dividend being reduced from 10 to 7½ per cent. American Telephone and Telegraph, Great Northern, and International Telephone and Telegraph lay under the Treasury ban of restricted dealings until this month, when part of the restriction was removed and prices became more correspondent to their proper market values. Some of the principal stocks and shares in the market, are the following:—

Stock or Share	*Dec. 27th,* 1939.	*High.* 1940.	*Low.* 1940.	*Dec. 27th,* 1940.	*Change on Year.*
American Tel. & Tel.	205½	230	176	200	−5½
Anglo-American pref.	94½	107	85	99	+4½
Cable & Wireless pref.	92½	99⅞	66	93½	+1
Cable & Wireless ord.	56½	65	27	56½	—
Great Northern ..	20½	20	11	12½	−8
International Tel. & Tel.	5	5½	2½	3	−2
Marconi Marine ..	27s. 6d.	30s. 0d.	18s. 3d.	19s. 3d.	−8s. 3d.

Manufacturing and Equipment

In the equipment and manufacturing group, the early part of the year saw something of a scramble for ordinary shares in the best-class commercial companies, owing to the impression that the prices of these would go ahead under the influence of expanding orders due to the war. The two Budgets, however, exercised a restraining effect. Prices on the whole are well maintained, but the 100 per cent. E.P.T. has modified previous expectations of increased dividends. Therefore, although demand continues to be a notable feature in the group, the prices on the whole are lower than those ruling at this time last year. Here are some of the changes:—

Ordinary Share.	*Dec. 27th,* 1939.	*High.* 1940.	*Low.* 1940.	*Dec. 27th,* 1940.	*Change on Year.*
Assoc. Electrical Ind.	38s. 9d.	43s. 3d.	26s. 6d.	40s. 0d.	+1s. 3d.
Babcock & Wilcox	41s. 3d.	50s. 0d.	28s. 6d.	39s. 6d.	−1s. 9d.
British Aluminium	50s. 0d.	56s. 0d.	29s. 0d.	40s. 9d.	−9s. 3d.
British Insulated ..	80s. 0d.	92s. 6d.	67s. 0d.	82s. 6d.	+2s. 6d.
Callender's	60s. 0d.	69s. 0d.	46s. 0d.	62s. 6d.	+2s. 6d.
Crompton Parkinson (5s.)	17s. 6d.	20s. 0d.	12s. 0d.	17s. 6d.	—
English Electric ..	31s. 3d.	33s. 9d.	16s. 6d.	23s. 9d.	−2s. 6d.
G.E.C.	75s. 0d.	83s. 3d.	53s. 3d.	77s. 0d.	+2s.
Ever Ready (5s.) ..	26s. 0d.	28s. 3d.	16s. 6d.	25s. 6d.	−6d.
Johnson & Phillips	41s. 3d.	50s. 9d.	32s. 6d.	45s. 0d.	+3s. 9d.
J. Lucas	56s. 3d.	60s. 6d.	40s. 0d.	50s. 9d.	−5s. 6d.
Siemens	20s. 0d.	23s. 9d.	15s. 6d.	17s. 6d.	−2s. 6d.

Other Changes

British Electric Traction deferred stock, which rose 200 points in 1939, shows a further gain of 50 points in 1940. The Home Railway stocks are mostly lower. Southern 5 per cent. preferred, for example, was 65 a year ago and now stands at 46½. London Transport "C" stock is not a subject for comparison because a year ago the price was "frozen" at a minimum of 65—almost double the current quotation now that the market is free. Brazilian Tractions came under the Treasury restriction ban: for months the price stood at a nominal 5½ as against 10½ at the beginning of the year. They are now quoted at 7 .

Confidence in the final outcome of the war is reflected in the firmness with which prices have stood up to war influences.

Gilt-edged Stocks Strong

The price changes on the week just ended are few and far between. For the first time in the remembrance of Stock Exchange members, the House was open on Boxing Day, December 26th, in accordance with the Act that removed the day from the bank holidays of the year. Brazilian Tractions rose, on that day, to 7 . Gilt-edged stocks wound up the year with a notable display of strength. London and Home Counties 4½ per cent. is up 2 points to 107½; West Midland fives are unchanged at 105½. Electrical Distribution of Yorkshire shares are half-a-crown higher at 35s.; London Associated have recovered to 15s. Demand continues for Enfield Cable ordinary, the price of which at 47s. 6d. is again ¼ better. Pye deferred at 10s. have put on a florin. Westinghouse Brake at 40s., Ward & Goldstone at 13s. 9d., and Murex at 78s. 9d. are amongst those that improved at the close of the year.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1940 High-est	1940 Low-est	Dividend Pre-vious	Dividend Last	Middle Price Dec. 30	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies							
Bournemouth and Poole	63/6	36/6	15	15	43/9	..	—
British Power and Light	30/–	20/–	7	7	26/–	..	5 7 8
City of London	28/–	20/–	7½	7½	21/3	..	—
Clyde Valley	38/6	24/–	8	8	33/9	..	4 14 10
County of London	43/3	21/–	10½	10½	32/6	+6d.	6 9 4
Edmundson's:							
7% Pref.	32/–	24/3	7	7	28/3	..	4 19 1
Ord.	27/6	18/6	9	6	23/6xd.	..	5 2 2
Elec. Dis. Yorkshire	40/3	32/–	9	9	35/–	+½	5 2 9
Elec. Fin. and Securities	42/–	34/6	12½	12½	38/9	..	6 15 0
Elec. Supply Corporation	48/–	39/–	12	11½	37/–	..	6 4 4
Isle of Thanet	16/–	5/6	4	4	6/–	..	—
Lancs Light and Power	33/–	21/6	7½	7½	27/6	..	5 9 1
Llanelly Elec.	21/–	17/–	5½	5½	18/–	..	6 2 5
Lond. Assoc. Electric	21/–	12/6	7	5½	15/–	+⅛	—
London Electric	35/–	19/–	8	7	20/–	..	7 0 0
London Power Deb. Red.	105½	100	5	5	102½	+1	4 17 6
Metropolitan	41/6	22/6	12	10	32/6	+6d.	6 3 0
Midland Counties	39/–	23/3	8	8	32/6	..	4 18 6
Mid. Elec. Power	40/–	29/6	9	9	33/9	..	5 6 8
Newcastle Elec.	29/9	22/6	7	7	22/6	..	6 7 3
North Eastern Elec.:							
Ordinary	31/6	16/6	7	7	25/–	..	5 12 0
7% Pref.	32/6	25/6	7	7	28/3	..	4 19 1
Northampton	44/–	38/–	10	10	40/–	..	5 0 0
Notting Hill 6% Pref. (£10)	10¼	9	6	6	9	..	—
Northmet Power:							
Ordinary	42/3	22/6	10	10	31/3	..	—
6% Pref.	29/–	23/–	6	6	26/6	..	4 10 7
Richmond Elec.	24/6	18/–	7	6	18/9	..	—
Scottish Power	38/–	24/–	8	8	33/3	..	4 16 3
Southern Areas	21/3	12/9	5	5	14/6	..	6 18 0
South London	23/3	20/–	7	7	20/–	..	7 0 0
West Devon	20/–	17/6	5	5	20/–	..	5 0 0
West Glos.	22/–	15/–	2½	4½	16/3	..	5 10 10
Yorkshire Elec.	40/–	23/6	8	8	33/9	..	4 14 10
Overseas Electricity Companies							
Atlas Elec.	4/–	1/3	Nil	Nil	1/9	..	—
Calcutta Elec.	37/–	22/6	10*	8*	32/6	..	4 18 6
Cawnpore Elec.	30/–	24/–	10	10	26/3	..	7 12 4
East African Power	25/6	19/6	7	7	20/9	..	6 15 0
Jerusalem Elec.	24/–	15/–	7	7	20/–	..	7 0 0
Kalgoorlie (10/–)	12/6	9/6	7½	7½	11/6	..	6 10 5
Madras	26/9	21/6	8*	6*	25/–	..	—
Montreal Power	35½	30	1½	1½	32	..	—
Palestine Elec. "A"	25/–	10/–	5*	Nil	17/6	+½	—
Perak Hydro-electric	20/3	13/–	2½	6	16/3	..	7 7 8
Shawinigan Power	27½	19	83cts.	90cts.	19	–1	—
Tokyo Elec. 6%	69	52	6	6	30	..	20 0 0
Victoria Falls Power	75/9	56/6	15	15	70/–	..	4 5 9
Whitehall Investments Pref.	17/9	8/–	7½	7½	11/–	+1/–	13 10 4
Public Boards							
Central Electricity:							
1950–70	110½	104	5	5	109	..	4 11 9
1955–75	112½	106	5	5	110	..	4 11 0
1951–73	107½	102	4½	4½	105	..	4 5 9
1963–93	96½	90	3½	3½	94	+1	3 14 6
London Elec. Trans. Ltd.	92	87½	2½	2½	93	..	2 15 9
London & Home Counties							
1955–75	113½	105	4½	4½	107½	+2	4 3 9
Lond. Passenger Transport:							
A	116	104	4½	4½	109	+1	4 2 7
B	116	102½	5	5	104	..	4 15 8
C	65½	25	1½	1½	33	..	4 11 0
West Midland Joint Elec.							
1948–68	106½	103	5	5	105½	..	4 14 9
Telegraph and Telephone							
American Tel. & Tel.	230	176	9	9	200	..	4 10 0
Anglo-Am. Tel.:							
Pref.	107	85	6	6	99	..	6 3 0
Def.	23¾	18	1½	1½	23½	..	6 7 8
Anglo-Portuguese	22/6	10/–	8	8	15/–	..	10 13 4
Cable & Wireless:							
5½% Pref.	99¾	66	4½	5½	93½	+1	5 17 8
Ord.	65	27	4	4	56½	+2	7 1 7
Income	99¾	93	..	..	98½	..	4 1 3
Canadian Marconi $1	6/–	4/–	Nil	4cts.	4/–	..	—
Globe Tel. & Tel.:							
Ord.	32/6	21/6	7½*	6*	26/3	..	4 11 5
Pref.	27/9	22/6	6	6	25/–	..	4 16 0
Great Northern Tel. (£10)	20	11	20	20	12½	..	—
Inter Tel. & Tel.	5½	2½	Nil	Nil	3	..	—
Marconi-Marine	30/–	18/3	10	7½	19/3	..	7 13 10
Oriental Telephone Ord.	2⅞	45/–	12*	11½*	2⅝	..	4 16 10
Telephone Props.	15/–	11/–	6	6	11/3	..	10 13 4
Telephone Rentals (5/–)	9/6	5/3	10	10	7/3	..	6 18 0

Company	1940 High-est	1940 Low-est	Dividend Pre-vious	Dividend Last	Middle Price Dec. 30	Rise or Fall	Yield p.c. £ s. d.
Traction and Transport							
Anglo. Arg. Trams:							
First Pref. (£5)	4/3	1/–	Nil	Nil	2/–	..	—
4% Inc.	11½	2	Nil	Nil	9	..	—
British Electric Traction:							
Def. Ord.	830	400	5	45	750	..	6 4 4
Pref. Ord.	169	130	8	8	145	..	5 10 3
Bristol Trams	48/6	32/6	10	8*	37/6	..	—
Brazil Traction	12½	5½	$1	50c.	7½	+½	—
Calcutta Trams	24/–	16/3	8	5½	19/–	..	5 15 9
Cape Elec. Trams	18/6	16/–	5	5	17/–	..	5 17 8
Lancs Transport	35/–	27/6	10	10	35/–	..	5 14 3
Mexican Light:							
1st Bonds	36	25	5	5	35	..	—
Rio 5% Bonds	95	74	5	5	85	..	5 17 8
Southern Rly.:							
5% Prefd.	79	35	5	5	46½	..	10 15 0
5% Pref.	104½	59	5	5	82½	..	6 1 3
T. Tilling	45/9	29/–	10	10	39/6	..	5 1 3
Tilling & B.A.	47/6	41/9	9*	8*	44/6	..	—
West Riding	35/–	25/–	10	10	33/6	..	5 19 5
Equipment and Manufacturing							
Aron Electricity Ord.	17/6	10/–	15	Nil	15/–	..	—
Assoc. Elec.:							
Ord.	43/3	26/6	10	10	40/–	..	5 0 0
Pref.	36/6	32/3	8	8	35/–	..	4 11 5
Automatic Telephone & El.	47/3	32/–	12½	12½	40/–	..	6 5 0
Babcock & Wilcox	50/–	28/6	10	11	39/6	..	5 11 2
British Aluminium Ord.	56/–	29/–	12½	12½	40/9	..	—
British Insulated Ord.	92/6	67/–	20	20	82/6	..	4 17 0
British Thermostat (5/–)	14/9	6/6	18½	18½	11/3	..	8 4 6
British Vacuum Cleaner (5/–)	12/–	4/9	40	12½	6/3	..	10 0 0
Brush Ord.	4/6	1/9	Nil	Nil	3/9	..	—
Callender's	69/–	46/–	15	15	62/6	..	4 16 0
Chloride Elec. Storage	72/6	55/–	15	15	60/–	..	5 0 0
Consolidated Signal	72/6	59/–	36½	17	60/–	..	5 13 4
Crabtree (10/–)	24/9	17/6	17½	17½	22/6	..	7 15 7
Crompton Parkinson:							
Ord. (5/–)	20/–	12/–	30	20	17/6	..	5 14 3
E. K. Cole (5/–)	5/–	2/6	10	Nil	4/6	..	—
Elec. & Musical Industries (10/–)	10/3	4/3	5	Nil	7/9	..	—
Electric Construction	36/3	27/6	13½	10	27/6	..	7 5 6
Enfield Cable Ord.	56/–	40/6	25	16½	47/6	+⅛	6 16 10
Electrical Switchgear (10/–)	22/6	20/–	16	10	20/–	..	5 0 0
English Electric	33/9	16/6	10	10	28/9	..	6 13 4
Ensign Lamps (5/–)	15/3	12/6	25	25	15/–	..	8 6 8
Ericsson Tel. (5/–)	39/3	23/–	25*	25*	32/6	..	—
Ever Ready	28/3	16/6	30	40	25/6	..	7 16 10
Falk Stadelmann	18/3	12/6	6	7	14/6	..	9 13 2
Ferranti Pref.	25/–	22/–	7	7	23/9	..	5 18 0
G.E.C.:							
Pref.	32/6	26/–	6½	6½	30/–	..	4 6 8
Ord.	83/3	53/3	20	20	77/–	..	5 4 0
Greenwood & Batley	25/6	20/–	15	15	20/–	..	13 0 0
Hall Telephone (10/–)	18/6	8/9	15	10	11/3	..	8 18 0
Henley's (5/–)	21/6	12/6	20	20	18/9	..	5 6 8
4½% Pref.	21/2	20/6	4½	4½	21/3	..	4 4 8
Hopkinsons	46/9	32/6	12½	15	38/9	..	7 14 10
India-Rubber Pref.	21/–	19/6	5½	5½	20/–	..	5 10 0
Intl. Combustion	121/3	70/–	32½	32½	4½	..	7 17 9
J. Lucas	60/6	40/–	15	15	50/9	+2/–	5 18 0
Johnson & Phillips	50/9	32/6	12½	15	45/–	..	6 13 4
Lancashire Dynamo	59/9	47/6	25	20	47/6	..	8 8 5
Laurence Scott (5/–)	11/–	6/–	15	15	7/–	..	10 14 2
London Elec. Wire	25/6	20/–	7½	7½	22/6	..	6 13 4
Mather & Platt	46/6	30/–	13½	10	34/6	..	5 16 0
Metropolitan Elec. Cable Pf.	22/–	21/3	5½	5½	21/3	..	5 3 6
Murex	86/9	52/6	20	20	78/9	+⅛	5 1 6
Pye Deferred (5/–)	9/–	6/9	25	25	10/0	..	14 5 8
Revo (10/–)	20/9	11/6	17½	5	17/6	..	2 17 6
Reyrolle	60/6	41/–	12½	12½	46/3	..	5 8 2
Siemens Ord.	23/9	15/6	7½	7½	17/6	..	8 11 6
Strand Elec. (5/–)	2/3	9d.	4	2	1/3	..	8 0 0
S. Smith (1/–)	8/–	3/6	37½	50	7/6	..	6 13 4
Switchgear & Cowans (5/–)	11/9	5/6	20	10	7/6	..	6 13 4
Telegraph Condenser (10/–)	8/9	6/3	5	..	7/6	..	—
Telegraph Construction	42/6	29/–	10	10	33/9	..	5 18 6
Telephone Mfg. (5/–)	9/–	5/–	9	9	7/–	..	6 8 7
Tube Investments	96/9	59/–	23½	23½	92/6	..	5 4 0
Vactric (5/–)	3/6	2/–	4	Nil	2/3	..	—
Vickers (10/–)	22/–	9/6	10	10	15/–	+3d.	6 13 4
Ward & Godstone (5/–)	19/9	12/6	20	20	13/9	+⅛	7 5 6
Westinghouse Brake	46/–	30/6	17½	10	40/–	+½	5 0 0
Walsall Conduits (4/–)	26/6	17/6	55	55	23/9	..	9 5 0
West, Allen (5/–)	7/–	3/–	7½	10	3/9	..	10 0 0

* Dividends are paid free of Income Tax.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), Millbank, Westminster, London, S.W.1.

Australia. — BRISBANE. — February 6th. City Electric Light Co., Ltd. 415-V, three-phase, 50-cycle, indoor-type, metal-clad switchgear. (T.23623/40.)*

Birmingham.—January 15th. Salvage Department. 44 lead plate batteries for electric refuse vehicles. (December 27th.)

Hull.—January 10th. Town Council. Five tractors (electric or petrol-driven), for refuse collection or haulage work. Particulars from the public cleansing superintendent, Alfred Gelder Street.

New Zealand. — WELLINGTON. — Public Works Department. January 14th. Two 3,000-kVA, 11-kV, three-phase, 50-cycle outdoor-type voltage regulating transformers and control equipment. (T.22238/40.)*

January 29th. Post and Telegraph Department. Condensers, conductor cords and headbands. (T.23413/40.)*

Plymouth.—January 14th. Corporation. Boiler tubes and a portable coal loading conveyor. (See this issue).

South Africa.—PRETORIA.—February 12th. City Council. One or, alternatively two, 18,750-kW turbo-alternators and exciters, with condensing and auxiliary plant. (See this issue).

January 30th. Union Tender & Supplies Board. 200 lightning protectors. (T.23336/40.)*

January 16th. One 5-kW, 220/380-V alternator, direct-coupled to a water-cooled petrol engine. (T.23310/40.)*

CAPE TOWN.—January 28th. Electricity Department. Three oil-immersed single-phase 270-kVA transformers. (T.23173/40.)*

January 29th. Air conditioning plant. (T.23387/40.)*

Southern Rhodesia.—SALISBURY.—March 10th. City Electricity Department. 374 meters of various types. (T.23645/40.)*

Orders Placed

Bedford.—Town Council. Recommended. Supply and erection of five 36-in. fans for ventilation at generating station (£372).—Sturtevant Engineering Co., Ltd.

Brechin. — Town Council. Accepted. Electrical work at 22 houses (£299).—Stenson & Co.

Glasgow.—Clyde Navigation Trustees. Accepted. Control gear (£4,726).—Igranic Electric Co.

Norwich.—Education Committee. Accepted. Electrical installation at the workshop at Norwich College (£2,450).—A. Pank & Son, Ltd.

Warrington.—Water Committee. Accepted. Cable. British Insulated Cables, Ltd.

West Lancs.—Rural Council. Accepted. Overhead lines for shelters.—Liverpool Electricity Department. Wiring shelters.—C. E. Pearson.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ashton-under-Lyne. — Hotel, Queen's Road; A. Buckley, resident architect, Gartside's (Brookside Brewery), Ltd., Brookside Brewery, Ashton-under-Lyne.

Athlone.—Houses (10); M. J. Carahy, clerk and law agent, Town Hall.

Barnt Green.—Conversion of "Long Rede" into maternity unit for Birmingham General Hospital; J. & A. Brazier, Ltd., builders, Worcester Road, Bromsgrove.

Bolton.—Extensions, Bark Street Mills; S. Crompton. Store, Salop Street; T. Carling & Co., Ltd.

Bootle.—Deep shelters on five sites (38,000 persons) for T. C.; W. A. Harrison, borough engineer, Town Hall.

Cheltenham.—Extensions, sewage disposal works, for R.D.C.; J. H. Haiste, consulting engineer, Middleton Chambers, Lowgate, Hull. Shelter and sanitary wing, Folland Aircraft, Ltd.

Crumpsall Vale.—Extensions to canteen; I.C.I. Ltd., Hexagon House, Blackley, Manchester.

Darlaston.—Community centres at Primitive Methodist School and Dorset Road School for U.D.C.; N. H. Hughes, surveyor, Town Hall.

Dublin.—Houses (332), with estate office annexe, Cabra West housing area, for T.C.; H. G. Simms, housing architect, 5, Wellington Quay.

Cathedral, city hall, Government buildings, etc., for General Purposes Committee; Prof. Patrick Abercrombie, Sydney Kelly, and Manning Robertson, consultants.

Dundee.—Completion of partly constructed houses, for T.C.; city engineer, Town Hall, City Chambers.

Dunoon.—Adaptation, Struan Lodge, as maternity hospital, for Argyllshire C.C.; county architect, Education Offices.

Felling-on-Tyne.—Premises, Stoneygate Lane, for E. Hind (South Bank), Ltd., metal workers, South Bank, Middlesbrough.

Glasgow.—Reconstruction of premises at 94, Paterson Street for John Craig & Sons; Thomson, Sandilands and McLeod, architects, 248, West George Street.

Gravesend.—Rebuilding of part of school. Portion of new police headquarters and fire station, for T.C.; borough architect, 5, Woodville Terrace.

Hebburn-on-Tyne.—Alterations and new lounge at the Caledonian Hotel; Hetherington and Wilson, architects, County Chambers, Westgate Road, Newcastle-on-Tyne.

Hyde.—Additions, Godley Mills, Bottom Street; James North & Sons, Ltd.

Jarrow.—Completion of 28 houses, Simonside, T.C.; borough engineer.

Kirkham.—Y.M.C.A. building and canteen for building committee; H. & J. R. Bradshaw, builders, Hill Lane, Blackley, Manchester.

London.—Twenty additional cold stores, for Ministry of Works and Buildings; Hal Williams & Partners, consultants, 43, Bedford Square, London, W.C.1.

EALING.—Communal shelters (600), for B.C.; C. W. Seddon, borough engineer, Town Hall.

Manchester.—Works additions; J. E. Kewell, architect, 290, Oxford Road, Chorlton-on-Medlock.

Canteen for works, Cheetham Hill Road; David Rosenfield, Ltd., 15, Victoria Street.

Maryport.—Houses (56), Shortacres, for North-Eastern Housing Association, Newcastle-on-Tyne; Couves and Partners, architects, 2 Westfield Avenue, Newcastle-on-Tyne.

Middlesex.—School, Joel Park Estate, Northwood Hills, for C.C.; county architect, Middlesex House, 20, Vauxhall Bridge Road, London, S.W.1.

Nantwich.—Housing scheme (£13,600) for R.D.C.; H. Crabtree, engineer and surveyor, R.D.C. Offices.

Newcastle-on-Tyne.—Extensions to works for Angus & Co.; Hetherington and Wilson, architects, County Chambers, Westgate Road, Newcastle.

North Riding.—School, Ormesby; additional domestic science accommodation, Basingwold; improvements, Snape School; and alterations, Eston Grangetown School; county architect, County Hall, Northallerton.

Northampton.—Factory additions, Stimpson Avenue; J. Sears & Co. (True-Form) Ltd.

Rochdale.—Extensions, cooking centre, with cooking apparatus, Brownhill Open-Air School, Heights Lane; H. Bann, town clerk, Town Hall.

Stockton-on-Tees.—Extensions to laboratory; Imperial Chemical Industries, Ltd.

Foundry extensions; Ashmore, Benson Pease & Co., Ltd.

Stoke-on-Trent.—Extensions to offices; A. G. Hackney & Co., Ltd., Fairfield Pottery, Hanley.

Feeding centres; borough engineer.

Workshops and stores, Princes Road, Hartshill; Infirmary governors.

Stratford-on-Avon.—Extensions to isolation hospital, for T.C.; P. C. Smart, borough engineer, Municipal Offices.

Thurso.—Church, Campbell Street; Rev. D. R. Mackay, Thurso Central Congregational Church.

Timperley.—Hospital extensions, Baguley Sanatorium. for H.M. Office of Works; Adshead, Topham, and Adshead, architects, 14, Ridgefield, Deansgate, Manchester.

Trafford Park.—Laboratory at Works, Tenax Road; Geigy Colour Co., Ltd., Tenax Road.

Uttoxeter.—Houses (20), Blithfield, Leigh, Gratwich and Bramshall for R.D.C. (£9,800); Ripleys, Ltd., builders, Moseley Street, Ripley, Derby.

Wellingborough.—Additions and alterations at Isolation Hospital, for the Eastern Northamptonshire Joint Hospital Board; F. E. Gadd, clerk, Council Offices.

Wellington (Salop).—Twelve shops and maisonettes, Donnington Wood, for the R.D.C.; J. B. Cooper, architect, 177, Corporation Street, Birmingham.

West Gorton.—Works extensions, H. Burke & Son, civil engineers, 15a, Green Lane, Brook Street, Chorlton-on-Medlock.

York.—Reception hostel; city engineer.